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US Army Corps  
of Engineers  
Sacramento District

*Prospect Island, California*  
*Final Ecosystem Restoration Report and*  
*Environmental Assessment/Initial Study*  
*July 1999*

C-088783

C-088783

*Final Ecosystem Restoration Report and  
Environmental Assessment/Initial Study*

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*July 1999*



*Prospect Island  
California*



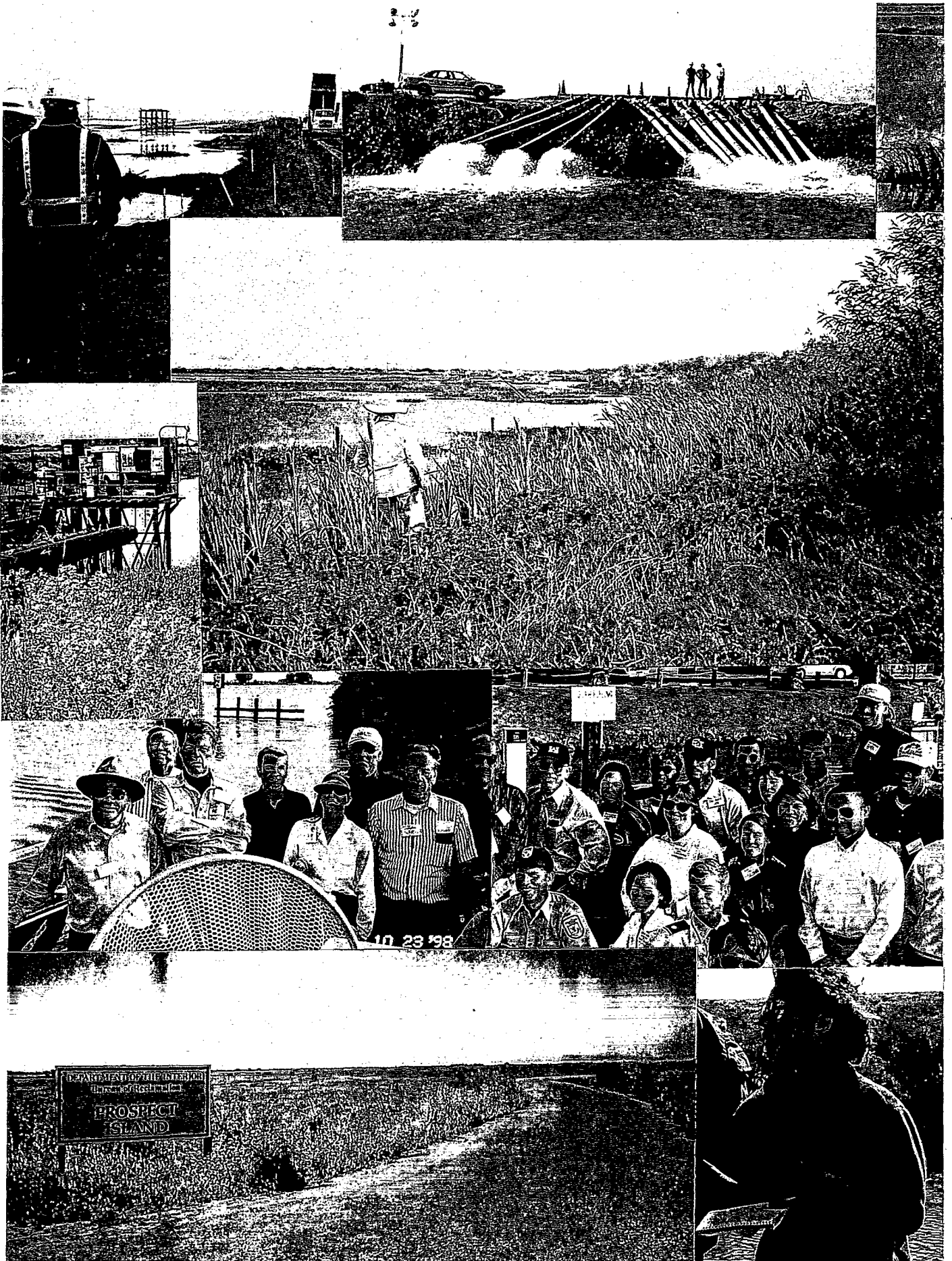
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SACRAMENTO DISTRICT



DEPARTMENT OF  
WATER RESOURCES  
STATE OF CALIFORNIA

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**Description of Prospect Island Photo Collage:**

1. CalFed funded construction project of cross levee repair, January 1999
2. CalFed funded pumping operation to dewater Prospect Island, October 1998
3. Waterfowl habitat within the flooded interior of Prospect Island, May 1997
4. Existing pumps used for past agricultural practices on Prospect Island, July 1998
5. Biological field investigation performed by Corps biologist, September 1998
6. Boat trip to Prospect Island with Congressman Vic Fazio, CalFed, DWR, BOR, and F&W, October 1998
7. Sign located at the northern entrance of Prospect Island, July 1998
8. Interview with the Sacramento Bee reporter on Prospect Island, July 1998

Final Ecosystem Restoration Report and  
Final Environmental Assessment/Initial Study

Prospect Island  
California

July 1999



US Army Corps  
of Engineers  
Sacramento District



Department of  
Water Resources  
State of California

## EXECUTIVE SUMMARY

The purpose of this report is to present a plan (1) to restore habitat that may be beneficial for rearing anadromous fish, for spawning and rearing delta smelt and Sacramento splittail, and for Federally listed waterfowl and shorebirds on the Pacific Flyway and (2) to provide high-quality riparian, shaded riverine aquatic, mudflat, tidal freshwater marsh, upland, and shallow water habitat for a wide variety of aquatic, avian, and terrestrial species. The study, which served as the basis for this ecosystem restoration report, assessed environmental problems, developed restoration objectives, and formulated alternative restoration plans for Prospect Island and documented compliance of the selected plan with the National Environmental Policy Act and the California Environmental Quality Act.

Prospect Island is in Solano County in the northwestern part of the Sacramento-San Joaquin Delta (Delta). The island is bounded by the Sacramento River Deep Water Ship Channel (ship channel) to the west, the remnants of Little Holland Tract to the north, Miner Slough to the east, and the confluence of the ship channel and Miner Slough to the south. Prospect Island consists of several parcels of land owned by various landowners. The largest portion of the island to the north, 1,228 acres is owned by the U.S. Bureau of Reclamation. There is a 309 acre southern portion owned by the Port of Sacramento (Port). The Port of Sacramento also owns 88 acres along the ship channel levee. The California Department of Fish and Game owns a 36 acre parcel south of the Port's property. Two parcels on the east side of Prospect Island, one 9 acres and the other 22 acres, are privately owned. The restoration project area incorporates Reclamation's 1,228 acres and the Port's 88 acres. As a result, the total project area combining the two properties is 1,316 acres within the island.

Wetland, riparian, and upland habitats are required habitats for almost all of the Delta fish and wildlife. Construction of the Sacramento River Deep Water Ship Channel and Sacramento River Flood Control Project resulted in losses to wetland and riparian habitat. Less than 4 percent of the Delta's original wetland habitat remains. Restoration of Prospect Island would significantly increase wetlands in the Delta.

Alternatives were formulated by first identifying environmental problems in the area and formulating restoration objectives. Next, research was conducted to identify other wetlands and wetland restoration projects in the Delta and other tidally influenced areas. From this research, criteria were developed to meet the restoration objectives. Most of the alternatives included modifications to the interior sides of levees, construction of interior islands, use of plantings for erosion control, and levee breaching. From the array of alternatives, the selected plan was identified.

Construction of the selected plan would result in a restored freshwater tidal marsh and riparian ecosystem (Plate ES-1). Levee embankments with a broad, gradual slope and bench would be constructed on all existing perimeter levees on the interior side. The embankments would stabilize the

levees and provide shaded riverine aquatic habitat. Long, linear interior islands would be constructed within Prospect Island. The islands would also have a broad, gradual slope and a bench between the water level and the top of the island. Islands in the deeper water area would have a wider bench. The islands would decrease wind fetch lengths and maximize the water/land edge. All fill materials for the islands and embankments would be excavated from a central channel. The channel would also help create a flow-through system. Plantings would be used to protect levees and islands against erosion. After the embankments, islands, and plantings have been installed, both the Miner Slough and the ship channel levees would be breached. Both breaches would be ripped to prevent the breaches from widening. Cut and fill would be balanced onsite between islands, levee embankments, and the excavated channel.

In addition to providing construction fill materials, the excavated channel would facilitate tidal action within the site. Tidal action would discourage predator fish such as inland silverside and striped bass. The selected plan also includes three dead-end sloughs, which are preferred habitats of delta smelt. The plan's two breaches, one at the downstream end of Miner Slough and the other at the downstream end of the ship channel, allow out-migrating salmon smolt to access the site through the Miner Slough breach while continuing their downstream migration and allow in-migrating salmon access to Miner Slough through Prospect Island.

The first cost of the selected plan is estimated at \$6,000,000.

None of the environmental resources (including endangered species, vegetation, wildlife, fisheries, soils, climate, water quality, and air quality) would be significantly impacted. Overall, fisheries, waterfowl, shorebirds, and various threatened and endangered species, and vegetation are expected to benefit from the project. As a result, no environmental mitigation measures are required for this project.

The U.S. Fish and Wildlife Service, California Department of Fish and Game, California Department of Water Resources, CALFED, as well as other organizations have been active in the development of the selected plan. CALFED, a partnership of State and Federal agencies responsible for managing Delta resources, is developing a long-term solution to the problems affecting the Delta watershed. There is strong local support for a plan that would provide freshwater tidal marsh habitat in the Delta. The California Department of Water Resources (DWR) is the non-Federal sponsor for the restoration of Prospect Island. The project has support from U.S. Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (Service), National Marine Fisheries Service (NMFS), California Department of Fish and Game (DFG), Wildlife Conservation Board, Port of Sacramento (Port), Solano Irrigation District, Trust for Public Lands and Metropolitan Water District of Southern California, The Central Valley Habitat Joint Venture, CALFED, and Category III (a program under CALFED which funds projects addressing non-flow environmental effects such as unscreened water diversions; municipal, industrial, and agricultural pollution; overfishing and illegal fishing; fish passage barriers; and habitat degradation). In addition, Coastal America, a consortium of agencies (including



the Corps) that promote the environmental values of coastal areas, has officially endorsed the selected plan.

The environmental resources within the Delta have been declining for over the past 100 years. The selected plan would restore 1,316 acres of habitat composed of shallow open water, freshwater emergent marsh, mudflat, riparian, upland and shaded riverine aquatic habitat that may be beneficial for anadromous fish, delta smelt and Sacramento splittail, and Federally listed waterfowl and shorebirds on the Pacific Flyway.

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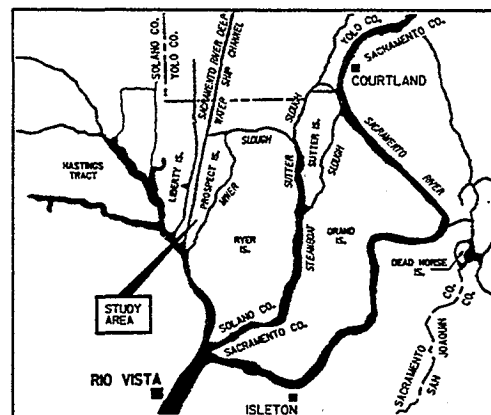
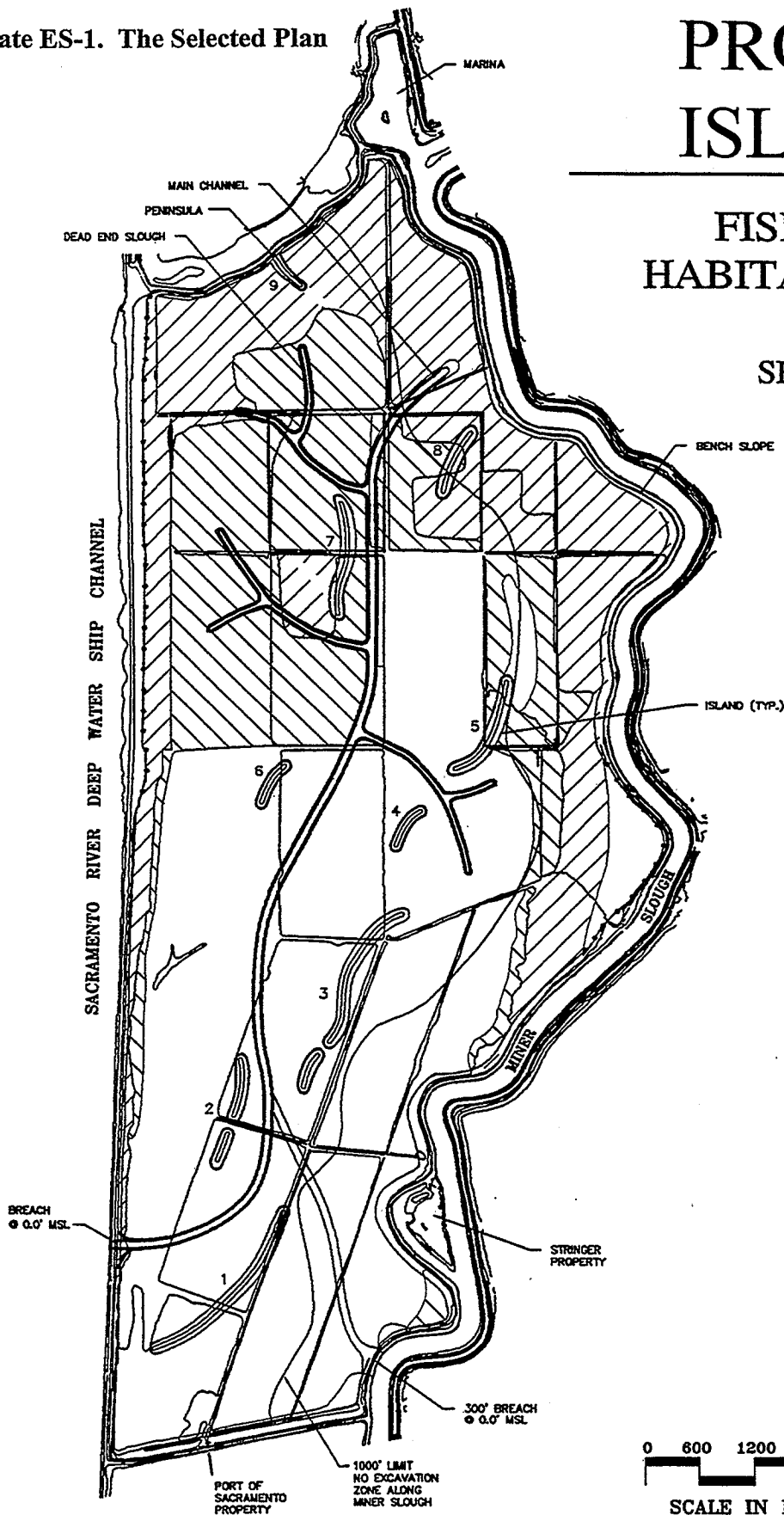
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# PROSPECT ISLAND, CA

## FISH & WILDLIFE HABITAT RESTORATION

### SELECTED PLAN



VICINITY MAP  
SACRAMENTO-SAN JOAQUIN DELTA, PROSPECT ISLAND, CA

#### KEY: ISLAND CONFIGURATIONS

ISLAND NO.	CONFIGURATION*	ISLAND LENGTH*
1	BARRIER ISLAND (40' BENCH/ 60' ISLAND/ 20' BENCH)	2,100
2	STANDARD ISLAND (40' BENCH/ 20' ISLAND/ 20' BENCH)	931
3	STANDARD ISLAND	1,801
4	BARRIER ISLAND	517
5	BARRIER ISLAND	928
6	STANDARD ISLAND	511
7	STANDARD ISLAND	1,024
8	BARRIER ISLAND	622
9	STANDARD ISLAND	456

\* ESTIMATED CONFIGURATIONS AND LINEAR FEET



0 600 1200 2400

SCALE IN FEET

HABITAT TYPES	SYMBOL	ACRES
OPEN WATER (>1.0' MSL)	[Symbol]	594.5
MUDFLAT (@ 0.0' MSL)	(NOT SHOWN)	4.0
TILE/EMERGENT (0.0' MSL TO 3.0' MSL)	[Symbol]	333.8
POTENTIAL TILE/EMERGENT (-0.5' MSL TO 0.0' MSL)	[Symbol]	230.0
SRA/RIPARIAN/UPLAND (>3.0' MSL)	[Symbol]	153.7
TOTAL ACREAGE:		1316.0

ES-6

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## TABLE OF CONTENTS

<b>ABBREVIATIONS AND ACRONYMS</b> .....	v
<b>CHAPTER 1. INTRODUCTION</b> .....	1
PROJECT AREA .....	1
PROJECT AUTHORITY .....	1
OTHER AGENCY ACTS AND AGREEMENTS AFFECTING PROSPECT ISLAND	2
Bay-Delta Accord and Category III .....	2
Framework Agreement and CALFED .....	4
Central Valley Project Improvement Act .....	4
PURPOSE AND SCOPE .....	6
PROJECTS TO BE MODIFIED .....	6
PRIOR STUDIES AND REPORTS .....	8
Corps of Engineers .....	8
Other Agencies .....	9
EXISTING WATER RESOURCES PROJECTS .....	10
Corps of Engineers .....	10
Other Agencies .....	12
CURRENT CORPS STUDIES .....	13
Sacramento-San Joaquin Delta Special Study .....	13
Little Holland Tract Reconnaissance Investigation .....	13
OTHER AGENCIES .....	13
STUDY PARTICIPANTS AND COORDINATION .....	14
<b>CHAPTER 2. EXISTING CONDITIONS</b> .....	15
TOPOGRAPHY .....	15
SOILS .....	15
HYDROLOGY .....	16
WATER SUPPLY .....	16
HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE .....	16
FLOODING .....	16
POPULATION .....	17
LAND USE .....	17
CULTURAL RESOURCES .....	18
FISH RESOURCES .....	18
VEGETATION/WILDLIFE HABITAT .....	19
WILDLIFE .....	20
SPECIAL STATUS SPECIES .....	20
RECREATION .....	21

<b>CHAPTER 3. ENVIRONMENTAL PROBLEMS AND OPPORTUNITIES</b>	23
GENERAL ENVIRONMENTAL PROBLEMS	23
Wetland Habitat	23
Riparian Habitat and Shaded Riverine Aquatic Cover	24
Fish Habitat	25
Effects of Corps Projects	26
MAINTENANCE COSTS	26
OPPORTUNITIES	27
Habitats	27
Maintenance Cost Reduction	28
FUTURE WITHOUT THE PROJECT	28
<b>CHAPTER 4. PLAN FORMULATION</b>	29
FORMULATION PROCESS	29
RESTORATION OBJECTIVES	29
PLANNING CONSTRAINTS	29
ENVIRONMENTAL RESTORATION CRITERIA	30
HABITAT RESTORATION COMPONENTS	30
Water Surface	30
Environmental	32
Operations	34
<b>CHAPTER 5. ALTERNATIVE RESTORATION PLANS</b>	35
ARRAY OF RESTORATION PLANS	35
No-Action Alternative	35
Alternative 1	36
Alternative 2	36
Alternative 3	37
Alternative 4	39
Alternative 5	40
<b>CHAPTER 6. COMPARING THE ALTERNATIVE PLANS</b>	51
Habitat Restoration	52
MEETING RESTORATION OBJECTIVES	54
POTENTIAL ADVERSE EFFECTS	55
Environmental	55
Cultural	56
Operational	56
<b>CHAPTER 7. THE SELECTED PLAN</b>	61
DESCRIPTION OF SELECTED PLAN	61

PROJECT MODIFICATION COSTS .....	62
OPERATION AND MAINTENANCE .....	63
Monitoring Program .....	64
REAL ESTATE REQUIREMENTS .....	65
Utility Relocations .....	66
NEED AND JUSTIFICATION FOR THE PROJECT .....	67
INCIDENTAL BENEFITS .....	67
COST SHARING REQUIREMENTS .....	68
SUPPORT FROM OTHER AGENCIES .....	69
CONSTRUCTION SEQUENCE AND SCHEDULE .....	69
FURTHER STUDIES .....	71
 CHAPTER 8. PUBLIC INVOLVEMENT AND COORDINATION .....	 73
 CHAPTER 9. CONCLUSIONS .....	 75
 CHAPTER 10. RECOMMENDATION .....	 77

## TABLES

Table 1. Target restoration habitat types and criteria .....	31
Table 2. Elevations of different cover types .....	32
Table 3. Net gains/losses of cover type and habitat value for alternatives 3, 4, and 5 .....	53
Table 4. Comparison of first costs for alternatives 3, 4, and 5 .....	54
Table 5. First and average annual costs for alternatives 3, 4, and 5 .....	54
Table 6. Estimated Habitat Acreage .....	62
Table 7. Total Project Cost .....	63
Table 8. Division of Property within Prospect Island .....	65
Table 9. Cost Apportionment .....	68
Table 10. Project Schedule .....	70

## FIGURES

Figure 1. Map of Study Area .....	3
Figure 2. Aerial Photo of Prospect Island .....	5
Figure 3. Aerial Photo of Prospect Island with Little Holland Tract and Liberty Island .....	7
Figure 4. Existing Levee Section/No Grading .....	43
Figure 5. Typical Abandoned Levee/Bench Section .....	45
Figure 6. Typical Island Section .....	47
Figure 7. Barrier Island Section .....	49

## **PLATES**

- Plate ES-1. The Selected Plan
- Plate 1. Alternative 1
- Plate 2. Alternative 2
- Plate 3. Alternative 3
- Plate 4. Alternative 4
- Plate 5. Alternative 5

## **APPENDIXES**

- A. Letter of Intent
- B. Basis of Design
- C. Itemized Cost Estimate
- D. Real Estate Report
- E. Incremental Cost Analysis
- F. Geotechnical Reconnaissance Report
- G. Hydraulic Analysis for Prospect Island Alternatives
- H. Prospect and Ryer Island Hydrologic Analysis
- I. Seepage Analysis Conducted by Todd Engineers
- J. Shallow Groundwater Level Trends
- K. Environmental Assessment/Initial Study and FONSI/NegDec



## ABBREVIATIONS AND ACRONYMS

AAHU	average annualized habitat unit
BLM	U.S. Bureau of Land Management
Corps	U.S. Army Corps of Engineers
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento-San Joaquin Delta
DFG	California Department of Fish and Game
DWR	California Department of Water Resources
EA/IS	environmental assessment/initial study
ERR	Ecosystem Restoration Report
ESA	environmental site assessment
flood control project	Sacramento River Flood Control Project
FONSI	Finding of No Significant Impact
HTRW	hazardous, toxic, and radiological waste
LERRD	lands, easements, relocations, rights-of-way, and disposal areas
msl	mean sea level
mwI	mean water level
NegDec	Negative Declaration
NMFS	National Marine Fisheries Service
O&M	Operation and Maintenance
Port	Port of Sacramento
Reclamation	U.S. Bureau of Reclamation
Service	U.S. Fish and Wildlife Service
ship channel	Sacramento River Deep Water Ship Channel
SRA	shaded riverine aquatic
SWRCB	State Water Resources Control Board
TPL	Trust for Public Lands
WRDA	Water Resources Development Act

# **CHAPTER 1 INTRODUCTION**

## **PROJECT AREA**

Prospect Island is located in Solano County in the northwestern part of the Sacramento-San Joaquin Delta (Delta) (Figures 1, 2 and 3). The island is bounded by the Sacramento River Deep Water Ship Channel (ship channel) to the west, a remnant of Little Holland Tract to the north, Miner Slough to the east, and the confluence of the ship channel and Miner Slough to the south. The island is surrounded by levees on all sides, including an east-west cross levee separating Prospect Island and a remnant Little Holland Tract. The restoration project area encompasses the northern 1,316 acre portion of the island, which includes 1,228 acres owned by the Bureau of Reclamation (Reclamation) and 88 acres west along the Sacramento Deep Water Ship Channel levee owned by the Port of Sacramento (Port). There is an east-west cross levee dividing the Reclamation's property from the Port's property. Not included as a part of the project area but also located within the interior of Prospect Island is a 309 acre southern portion owned by the Port. Landowners owning other portions of the island is the California Department of Fish and Game (DFG). They own a 36-acre parcel south of the Port's 309 acre property. Located on the east side of Prospect Island are two privately-owned parcels, one 9 acres north of the cross levee and the other, 22 acres south of the cross levee.

## **PROJECT AUTHORITY**

This Ecosystem Restoration Report (ERR) is authorized by Section 1135 of the Water Resources Development Act (WRDA) of 1986, Public Law 99-662, as amended. Section 1135 of WRDA 1986 directs the U.S. Army Corps of Engineers (Corps) to modify Corps projects to improve the environment. WRDA 1986 provides:

The Secretary is authorized to review the operation of water resources projects constructed by the Secretary before the date of enactment of his Act to determine the need for modifications in the structures and operations of such projects for the purpose of improving the quality of the environment in the public interest...

The acquisition of 1,228 acres of Prospect Island by the U.S. Bureau of Reclamation (Reclamation) was authorized by House Report 2445, the 1994 Energy and Water Development Appropriations Act. This act provides that:

The additional \$1,900,000 provided for land retirement and water acquisition for fisheries habitat restoration and creation includes \$1,500,000 to be used to initiate the acquisition of Prospect Island in the Sacramento-San Joaquin Delta.

The source of these funds, the Central Valley Project Restoration Fund, was authorized in the Central Valley Project Improvement Act of 1992, Public Law 102-575. This fund was established "to

carry out programs, projects, plans and habitat restoration, improvement and acquisition provisions of the Act."

The Energy and Water Development Appropriations Act of 1995 provided funding for the acquisition of additional acreage for Prospect Island. House Report 4506 reads:

The Committee has included \$1,570,000 to complete acquisition of Prospect Island, an important project to restore wetlands and fisheries which will result in enhanced recreational opportunities in the Yolo Bypass and the Sacramento River Delta region.

Reclamation took ownership of 1,228 acres of Prospect Island when escrow closed in January 1995. The cost of the property was \$2.825 million. Other lands required by the project (88 acres) will be acquired in easement. In addition, one privately owned 9 acre parcel may be acquired. Acquisition of this small parcel would benefit the project by reducing the project long-term operation and maintenance costs.

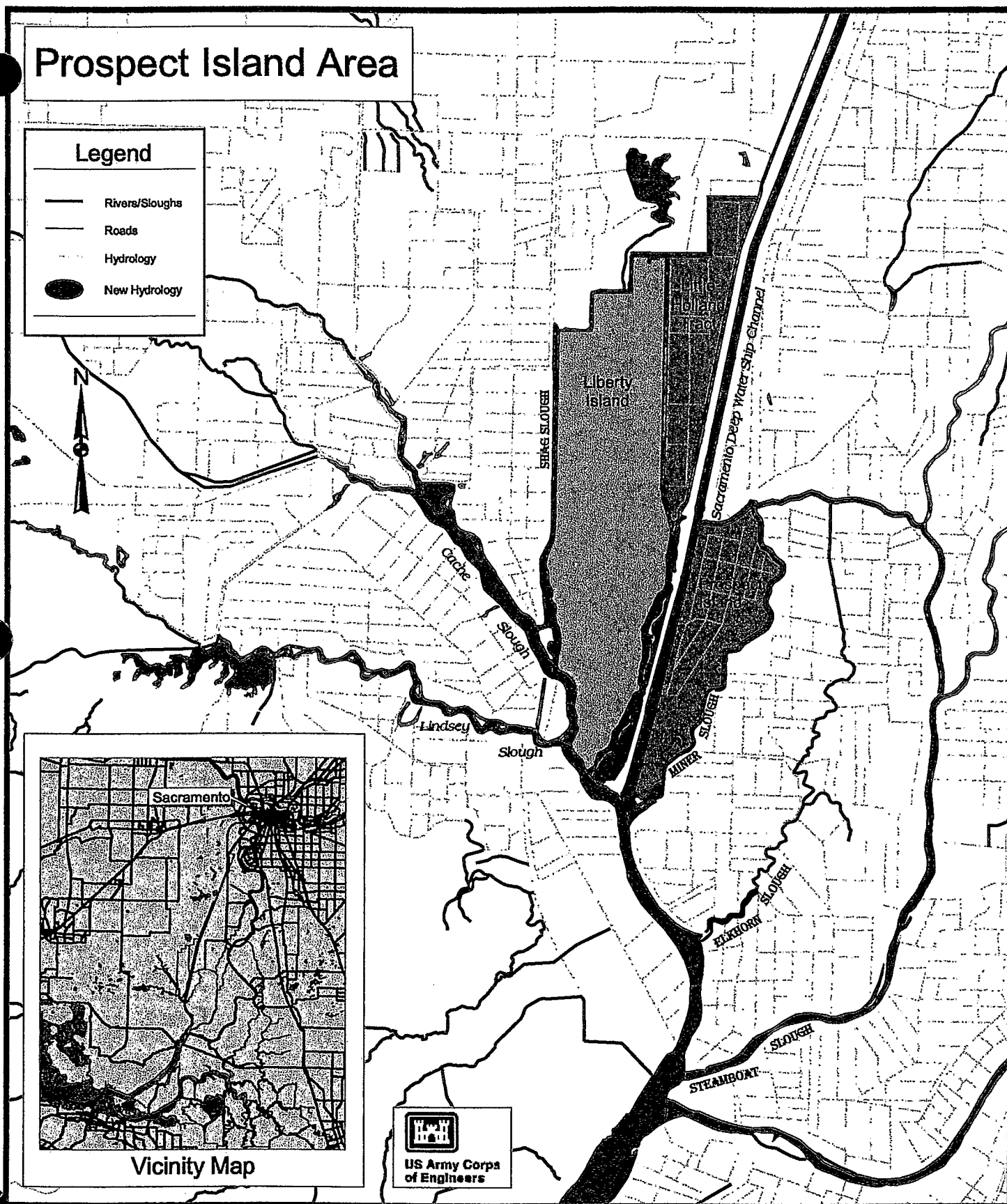
## **OTHER AGENCY ACTS AND AGREEMENTS AFFECTING PROSPECT ISLAND**

### **Bay-Delta Accord and Category III**

The "Principles for Agreement on Bay-Delta Standards Between the State of California and the Federal Government," also known as the Bay-Delta Accord, was signed on December 15, 1994, by representatives of the Federal and State government and urban, agricultural, and environmental interests. The Accord terminates on December 31, 1999, unless extended. The parties of the Bay-Delta Accord agreed to implementation of a Bay-Delta protection plan through the California State Water Resources Control Board consistent with specified principles. These principles apply to implementation of the Endangered Species Act, operations of the State Water Project and Central Valley Project, and implementation of "Category III" measures. Category III measures are non-flow related ecosystem restoration activities that will improve the health of the Bay-Delta ecosystem. The proposed Prospect Island Habitat Restoration Project has qualified as a Category III activity. The parties to the Accord made a financial commitment to fund the Category III measures. The California Department of Water Resources (DWR), as the non-federal sponsor, must fund 25 percent of the Prospect project costs and provide long-term management of the project. To fulfill this obligation, in 1995, DWR obtained approval from the Category III Steering Committee for 1.25 million dollars for the project and 1.25 million dollars for an endowment to fund long-term management of the project.

The DWR also has applied for Category III funds for a separate but related monitoring proposal for Prospect Island (see Attachment C of Appendix K for a description of the proposed Monitoring Program). The monitoring would occur for 3 years after project construction. The DWR proposes to convene a Prospect Island work team under the Interagency Ecological

Figure 1. Map of Study Area



Program (IEP) that would direct the monitoring program. The IEP consists of 10 member agencies which have an interest in the San Francisco Bay/Sacramento-San Joaquin Estuary and include: the DWR, California Department of Fish and Game, State Water Resources Control Board, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, Geological Survey, U.S. Army Corps of Engineers, National Marine Fisheries Service, Environmental Protection Agency, and the San Francisco Estuarine Institute. The Prospect Island IEP work team would meet on a monthly basis to review the monitoring activities conducted by staff of the DWR and the Department of Fish and Game and to ensure coordination between the different monitoring elements of the program. The DWR proposed Monitoring Program includes monitoring of fish and wildlife resources, water quality which includes disinfection byproduct precursors, vegetation, zooplankton, phytoplankton, benthos, and bathymetry.

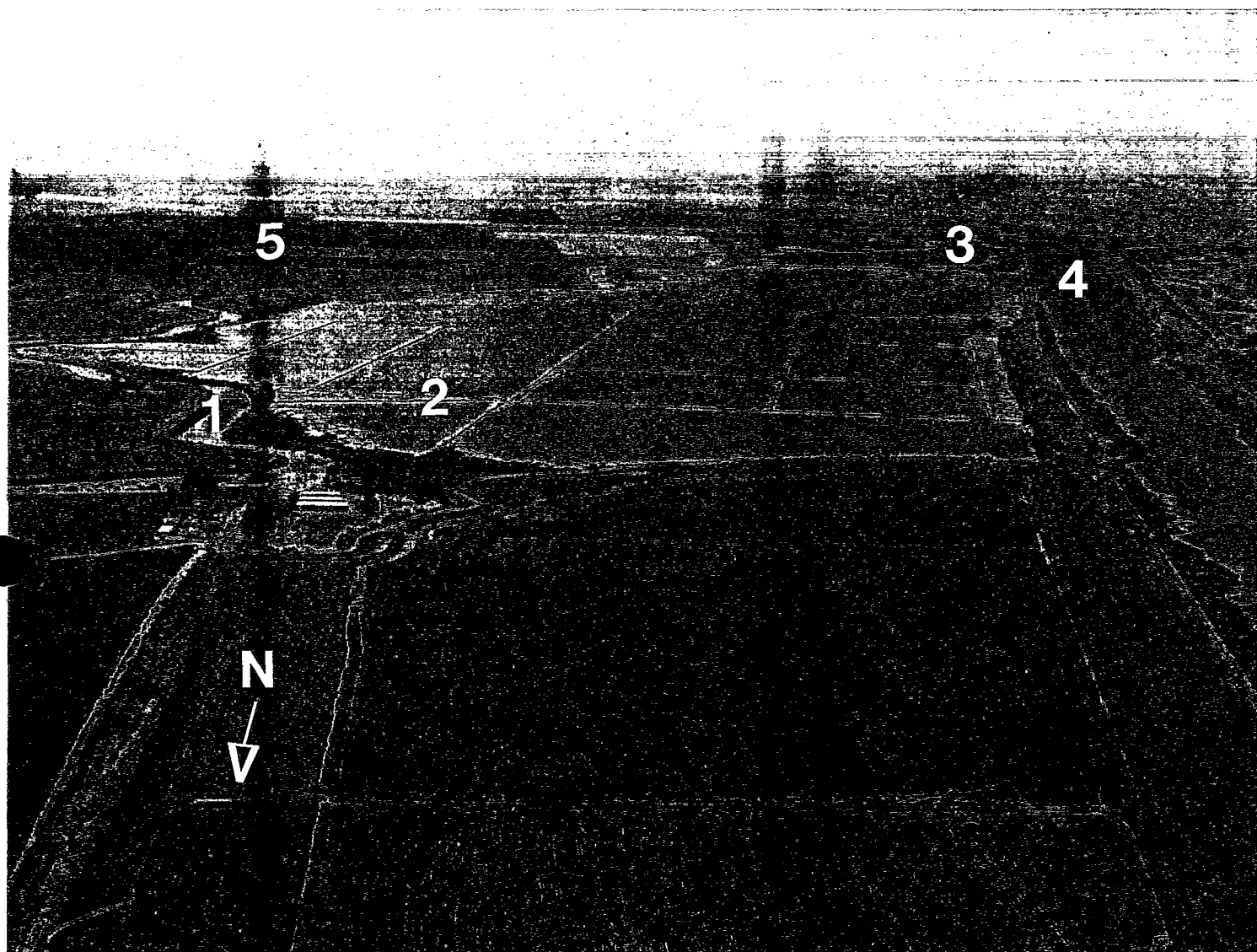
### **Framework Agreement and CALFED**

In June 1994, the California Water Policy Council and the Federal Ecosystem Directorate (FED) developed and signed a "Framework Agreement" for establishing a comprehensive program for coordination and communication between them with respect to environmental protection and water supply dependability in the Bay-Delta. The California Water Policy Council, consisting of eight State agencies, was created to coordinate activities related to long-term water policy. The FED, consisting of the Environmental Protection Agency, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and U.S. Bureau of Reclamation, was formed to coordinate Federal resource protection and management decisions in the Bay-Delta. These State and Federal agencies have become known as CALFED. CALFED has been working together with local agencies and stakeholders to develop a program for the long-term solution of problems affecting the Bay-Delta watershed, known as the CALFED Bay-Delta Program. In late 1999, CALFED is scheduled to complete its Programmatic EIS/EIR on the Bay-Delta Program. Category III is now a program under CALFED, funding activities to restore the Delta ecosystem. The CALFED agencies have indicated support for the Prospect Island Habitat Restoration Project as being consistent with the CALFED goals and objectives to restore the Delta ecosystem.

### **Central Valley Project Improvement Act**

In October 1992, Congress enacted the Central Valley Project Improvement Act (CVPIA). The CVPIA is Title XXXIV of Public Law 102-575 (previously referred to as H.R. 429), the multipurpose water legislation consisting of 40 separate titles providing for water resource projects. The CVPIA mandates changes in management of the Central Valley Project (CVP), particularly for the protection, restoration, and enhancement of fish and wildlife. The CVPIA adds fish and wildlife mitigation, protection, and restoration to existing fish and wildlife authorized purposes of the CVP. The U.S. Bureau of Reclamation and the U.S. Fish and Wildlife Service share responsibility for implementing the fish and wildlife provisions of the Act. The Prospect Island Habitat Restoration Project supports the mission and purpose of the CVPIA by providing habitat benefits for fish and wildlife and opportunities to monitor and evaluate the successes of restoring wetlands within the Delta.

Figure 2. Aerial Photo of Prospect Island



1. Miner Slough    2. Flooded interior of Reclamation-owned property    3. Port-owned property  
4. Sacramento River Deep Water Ship Channel    5. Ryer Island

## PURPOSE AND SCOPE

The purpose of this report is to provide documentation on the modifications to Prospect Island for environmental restoration. These modifications will restore environmental resources that have been degraded by construction and operation of the deep water ship channel and Sacramento River Flood Control Project (flood control project). The report identifies and evaluates potential fish and wildlife habitat restoration benefits obtained by modifying Prospect Island to restore environmental resources. More specifically, the ecosystem restoration report documents the need and opportunities for restoration; restoration plan formulation, evaluation, and selection process; benefits and costs of restoration; and compliance of the recommended restoration plan with environmental statutes and regulations of the National Environmental Policy Act and the California Environmental Quality Act. This ecosystem restoration report identifies and evaluates an array of possible restoration alternatives for Prospect Island and a recommended plan for implementation.

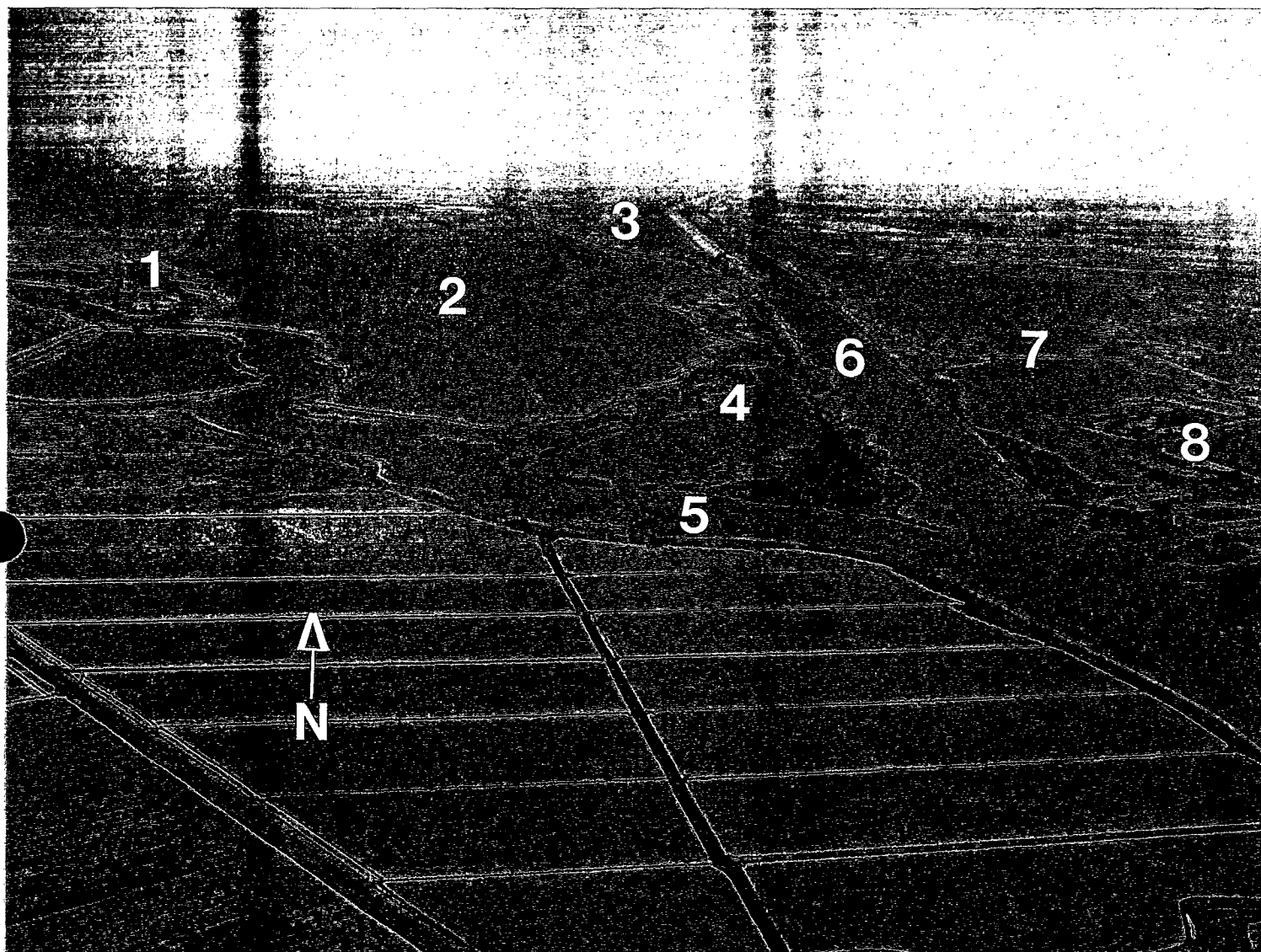
## PROJECTS TO BE MODIFIED

One project to be modified is the Sacramento River Deep Water Ship Channel (ship channel). This project, completed in 1963, consists of a 30-foot-deep channel from Suisun Bay to an inland harbor at Sacramento to accommodate deep-draft oceangoing vessels. Although the ship channel provides navigation to the Port of Sacramento (Port), its construction and operation have contributed to the environmental degradation of some riverine and wetland resources. Modification of the ship channel and its operation may restore parts of the river and wetland ecosystem. This study describes the Federal interest in restoring fish and wildlife habitat on Prospect Island while decreasing or eliminating maintenance costs on the ship channel levee on Prospect Island.

The Sacramento River Flood Control Project (flood control project), will also be modified slightly. This project, which consists of about 977 miles of levees, was first constructed in 1916 to reduce flood damages throughout the Sacramento River basin. The flood control project was implemented to provide efficient conveyance of floodflows and sediment carried from upstream areas. Although the project effectively reduces the potential for flood damage, its construction and operation have contributed to the degradation of environmental resources along the Sacramento River. Prospect Island is a part of the Yolo Bypass, a feature of the flood control project area since the early 1900's. Prospect Island levees are maintained at a lower elevation than neighboring levees specifically to allow floodflows onto Prospect Island. The restoration project will cause modifications to be made along the Prospect Island levees.

Breaches will be made along the Port of Sacramento Deep Water Ship Channel levee and Miner Slough levee. This would create an insignificant change in the flood control project as the flood waters would still be allowed to flood the area. In addition, the breaches would act to enhance flood flows through the Yolo Basin Bypass by alleviating pressure off of levees in the vicinity of Prospect Island including the neighboring Ryer Island levees.

Figure 3. Aerial Photo of Prospect Island with Little Holland Tract and Liberty Island



- |                 |   |                         |                    |
|-----------------|---|-------------------------|--------------------|
| 1. Shag Slough  | 2. Liberty Island                           | 3. Little Holland Tract | 4. Prospect Slough |
| 5. Cache Slough | 6. Sacramento River Deep Water Ship Channel | 7. Prospect Island      |                    |
| 8. Miner Slough |   |                         |                    |



## PRIOR STUDIES AND REPORTS

### Corps of Engineers

Corps reports of importance to the Prospect Island study are summarized below. Each report provided background information on the resources and opportunities in the area, as well as engineering and environmental data used in the technical analysis and environmental evaluation.

Northern California Streams, Sacramento River Fish Migration Study, April 1995. This reconnaissance study investigated ways to assist migration of anadromous fish, both upstream and downstream, through the Sacramento River system. Special emphasis was given to the possibility of using the William G. Stone Lock and ship channel for this purpose. The study limit extended from the Sacramento River at Verona to its downstream limit at Collinsville where the San Joaquin River meets the Sacramento River. Measures which were investigated include reoperation and/or modification of the lock to allow the fish to pass upstream and downstream; a fish ladder around the lock to allow for upstream migration, deflecting young out-migrants into Steamboat and Sutter Sloughs to provide a shorter and safer migration; and habitat improvements along the river. These improvements included shaded riverine aquatic (SRA) and riparian habitat and instream cover (boulders and fish groins) for fish. This reconnaissance study was completed in April 1995. The study was renamed to Lower Sacramento Revegetation in February 1999. The study will investigate alternatives to improve SRA and riparian habitat and instream cover for fish.

Prospect Island Fish and Wildlife Habitat Restoration Reconnaissance Investigation, April 1995. This study evaluated the Federal interest in restoring fish and wildlife habitat on Prospect Island while decreasing or eliminating maintenance costs on the ship channel levee on Prospect Island. The report identified an array of possible restoration plans for Prospect Island and recommended additional detailed studies.

Cache Slough/Yolo Bypass Levee, Sacramento River Flood Control Project, Biotechnical Slope Protection, Supplement No. 2, Design Memorandum 13, November 1990 (revised June 1991). This design memorandum studied the feasibility of using biotechnical slope protection on a cross levee between Cache and Shag Sloughs at the southern tip of Liberty Island. The project was constructed in 1992.

Cache Slough/Yolo Bypass Mitigation Area, Solano County, California, Office Report, Contract 42M2, Sacramento River Bank Protection Project, October 1990. The Cache Slough/Yolo Bypass mitigation site is very similar to the Prospect Island study. For this site, a cross levee was constructed to isolate the southern tip of Liberty Island from the northern portion of the island. Two mounds were created in the interior of the island, and then the levees of the isolated tip were breached in two places to restore tidal action to the site. This report evaluated different combinations of the habitat variables (such as topography, planting, and type of levee breach) of the mitigation site to determine the habitat value that could be realized by each combination.

Design and Monitoring of Wetland and Riparian Habitats Created with Dredged Materials, Deep Water Ship Channel Monitoring Programs, September 1990. This report summarized the results of 3 years of vegetation, fisheries, and wildlife monitoring on Donlon and Venice Cut Islands, two islands along the Stockton Deep Water Ship Channel. Habitat was created on these islands by placing dredged material on the islands and allowing the created habitat to be exposed to full tidal action. The report synthesized the results of monitoring to develop design criteria for future similar projects.

Pilot Study to Determine the Feasibility of Establishing a Nationwide Program of Fisheries Habitat Restoration and Creation, February 1990. The findings of the joint pilot study were incorporated into this joint document between NMFS and the Corps. The document described six sites (including the Prospect Island site) that meet the criteria of potentially providing environmental restoration opportunities on Corps projects without incurring additional cost to the Corps. The pilot project for Prospect Island was never pursued because the Corps lacked the authority to acquire lands for the project.

Prospect Island Fish Habitat Restoration Pilot Program, 1988. In October 1985 a Memorandum of Agreement between the Department of the Army and the National Marine Fisheries Service (NMFS) was signed committing both agencies to a 3-year pilot program to demonstrate the feasibility of restoring or creating fish and wildlife habitat on Corps projects without incurring additional cost to the Corps projects selected for habitat restoration. Prospect Island was studied as part of this effort. In 1988, the Corps' Sacramento District prepared a pilot report which addressed abandoning the island's current agricultural use and accompanying levee maintenance, breaching the ship channel levee, and converting the island to wetland habitat.

Feasibility Report and Environmental Impact Statement for Navigation and Related Purposes, Sacramento River Deep Water Ship Channel, California, July 1980. This report investigated the need for adding deep draft channels to the Port to improve existing channels and enhance existing environmental and recreation conditions in the study area. The area included the ship channel from Avon to the Port.

#### Other Agencies

Sacramento-San Joaquin Delta Atlas, 1993, California Department of Water Resources. This atlas provides a wide variety of information on the complex interrelationships of the Delta. The atlas includes information such as flood control levees, extent of saltwater intrusion since 1921, and legislative districts in the Delta.

## EXISTING WATER RESOURCES PROJECTS

### Corps of Engineers

Yolo Basin Wildlife Area. This wetlands restoration project was constructed by the Corps for the purpose of providing habitat for ducks, geese, other birds, and migrating waterfowl. The project restored wetlands in the Yolo Bypass to provide food, shelter, and a breeding ground for ducks and waterfowl. The land, historically a marshy flood plain rich in biodiversity, had been farmed since the 1950's when Monticello Dam was built upstream to regulate the waters of Putah Creek, forming Lake Berryessa. Lands were provided by the Wildlife Conservation Board and the California Department of Transportation. DFG is the non-federal sponsor and operates and maintains the project. The project was completed in August 1998, includes 2,323 acres of seasonal wetlands, 484 acres of uplands and grasslands, 185 acres of perennial wetlands, and 28 acres of riparian forest. The Yolo Basin Wetlands Project is a cooperative restoration project of the Corps, DFG, Yolo Basin Foundation, Service, DWR, Wildlife Conservation Board, and Ducks Unlimited.

Cache Slough Yolo Bypass Mitigation Area. This project was constructed in 1992 as a mitigation area for the Sacramento River Bank Protection Project. The site is 1½ miles from (or two islands west of) Prospect Island. The area has features that are very similar to those envisioned for Prospect Island, but on a much smaller scale. With only 176 acres, the Cache Slough site is about one-seventh the size of Prospect Island. Constructed at the confluence of Shag Slough and Cache Slough, the project involved constructing a levee across the tip of land created by the confluence, creating an independent cell. Next, islands were constructed within this cell to provide habitat and decrease fetch lengths for wind-induced wave action. The two levee breaches were then cut and tidal action returned to the site. Biotechnical slope stabilization was used on the newly constructed cross levee.

The levees of the mitigation site were not reinforced with biotechnical slope stabilization. Prevailing summer winds from the west and southwest caused considerable erosion of the eastern levee. Subsequently, biotechnical techniques were used on the eastern levee, and levee stability was significantly improved. The western levee of the site was not stabilized and has not experienced much erosion.

Sacramento River Deep Water Ship Channel. The Sacramento River Deep Water Ship Channel (ship channel) was authorized in 1946 by Public Law 79-525. The principal features of the project include the 30-foot-deep navigation channel extending from Suisun Bay to Sacramento, California; a harbor; and a shallow-draft barge canal. These features were completed in 1963. The ship channel was formed by widening and deepening existing channels from Suisun Bay to a point near Rio Vista and by excavating a 25-mile new channel from that point to Lake Washington, west of the City of Sacramento.

From river mile (RM) zero at New York Slough near Collinsville to RM 18.6, the bottom width is 300 feet. This reach lies within the Sacramento River and lower Cache Slough. From RM 18.6 to the Port of Sacramento, the manmade cut, the bottom width is 200 feet. The harbor/turning basin was constructed 1,200 feet long, 1,000 feet wide, and 30 feet deep. In 1989, the Corps initiated a project to deepen and widen the ship channel, as authorized in a 1985 supplemental Appropriations Act. The turning basin was deepened from 30 to 35 feet, and about 10 miles of the channel was deepened to 35 feet downstream to RM 35 in 1991. Deepening was then stopped because of conflict over responsibility for relocation of three gas pipelines. Construction is expected to continue when this issue is resolved.

The project also includes a deep-water harbor and turning basin at Washington Lake, a connecting barge canal with a navigation lock that connects the harbor to Sacramento River for transfer of barges between the waterways, and a bascule bridge across the canal at the harbor end of the navigation lock. The 1½-mile-long barge canal was constructed at 120 feet wide and 11 feet deep. The William G. Stone Lock is located within the barge canal. The lock is 640 feet long, 86 feet wide, and 13-feet deep, and has a 21-foot lift capability. The lock was constructed to alleviate saltwater intrusion from the ship channel into the Sacramento River and to allow shallow draft vessels to navigate the fluctuating stage differences between the Sacramento River and the ship channel. The barge canal and lock connect the ship channel to the Sacramento River. Because the lock did not receive the amount of use that was originally anticipated, the lock is no longer operated for ship traffic.

About 90 to 100 ships pass through the ship channel each year.<sup>1</sup> These vessels travel up the channel at about 9 to 10 knots. The Port is the non-Federal sponsor for this project. Maintenance dredging of the manmade portion of the ship channel has been conducted only in 1969, 1974, 1981, 1984, 1994, and 1997.

During construction of the project, the channel was excavated across Prospect Island. As part of the agreement with the landowners on the island, the Corps constructed the levee adjacent to the ship channel and assumed responsibility for its continued operation and maintenance (O&M) under Corps navigation authorities. Since completion of the original channel and levee construction, rock bank protection has been required at Corps cost to protect against wave erosion. Federal responsibility for O&M was included in the authorization of the project in 1946. This includes maintenance and erosion protection for the levees protecting the entire west side of Prospect Island.

Sacramento River Flood Control Project. In 1917, this project to construct a comprehensive system of levees, overflow weirs, and flood bypass channels was authorized. The levee on the east side of Miner Slough along Ryer Island, across from Prospect Island, is part of the flood control project. The levees on the west side of Miner Slough along Prospect Island were authorized as part of the flood control project as tidal levees constructed to an 11-foot height to allow overtopping by flood waters.

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<sup>1</sup> Personal Communication, Bob Watson, Port of Sacramento, 1994.

## Other Agencies

Prospect Island. In 1995, Reclamation acquired 1,228 acres of Prospect Island from the Trust for Public Lands (TPL), a non-profit land trust that purchased an option on Prospect Island with the intent of acquiring the property and then selling it to Reclamation. Congress authorized and funded Reclamation to acquire Prospect Island in the 1994 and 1995 Energy and Water Development Appropriations Acts.

Stone Lakes Wildlife Refuge. The refuge was established in 1992 to protect and restore native Central Valley, California, habitats for resident wildlife, migratory birds, and special status species, provide migratory habitat for birds along the Pacific Flyway in North America, and provide educational and recreational opportunities for the public. The 9,000-acre preserve is located in the Cosumnes River, North and South Stone Lake, Stone Lake Slough, and Mokelumne River watersheds.

Cosumnes River Preserve. The Cosumnes River Preserve was established in 1987 with its first purchase of land. The site is located 20 miles south of Sacramento, California, just east of Interstate 5. The Preserve is home to California's largest remaining valley oak riparian forest, and is one of the few protected wetland habitat areas in the State. The Cosumnes River is the only free-flowing river left in California's Central Valley. The Preserve is a critical stop on the Pacific Flyway for migrating and wintering waterfowl. Over 200 species of birds have been sighted on or near the Preserve, including the State-listed threatened Swainson's hawk, greater and lesser sandhill cranes, Canada geese, and numerous ducks. The Preserve includes 12,000 acres of current and potential wetlands and valley oak forests.

State Water Project. The State Water Project, constructed and operated by the DWR, delivers up to 4.2 million acre-feet of water each year to 29 water supply contractors. More than two-thirds of all Californians and over 600,000 acres of farmland receive some water from the State Water Project. Since 1973, 18 dams and reservoirs, 17 pumping plants, 8 hydroelectric powerplants, and over 600 miles of aqueducts and pipelines have been constructed. The project is still under development.

In the Delta, three pumping facilities service the State Water Project via the South Bay Aqueduct, Governor Edmund Brown California Aqueduct, and North Bay Aqueduct. The closest pumping plant to Prospect Island is the Barker Slough pump. Located along Barker Slough, the pump is about 10 miles west of Prospect Island and services the North Bay Aqueduct.

Central Valley Project. The Central Valley Project (CVP) was authorized by the State and subsequently funded and built by the Federal Government. The CVP is the system of reservoirs, powerplants, pumping plants, and canals managed by Reclamation. The combined storage capacity is about 12 million acre-feet, which accounts for approximately 25 percent of California's developed surface water supply. The CVP irrigates approximately 3 million acres of farmland and provides water to more than 2 million urban residents as well as to wildlife refuges. Shasta Dam, the most prominent

upstream reservoir, was completed in 1949. In August 1951, the pumping station at Tracy in the southern Delta began delivering Sacramento River and Delta water to the upper San Joaquin Valley.

## **CURRENT CORPS STUDIES**

### **Sacramento-San Joaquin Delta Special Study**

This multiphased special study began with a cost-sharing agreement signed in August 1991 by the Corps, DWR, and the State Reclamation Board. Phase I of the study culminated in an initial report which described problems and opportunities for the Corps to improve or provide flood protection, fish and wildlife habitat, water quality through flood control, and navigation. Phase II began in May 1997 and will parallel the CALFED process and result in a regional planning report. CALFED is in the process of developing a long-term solution to the problems affecting the Delta watershed. The study will develop an overall framework to guide future Corps studies relating to flood control, environmental restoration, and navigation problems in the Delta. This study is also representative of the Corps involvement in CALFED.

### **Little Holland Tract and Liberty Island Reconnaissance Investigation**

This investigation determined the potential for flood control, environmental restoration, and related purposes on Little Holland Tract and Liberty Island. The area has been inundated and subject to tidal action continually since the levees failed in 1983 and has since developed and matured as a tidally influenced wetland. When flooded, Little Holland Tract provides valuable habitat for the delta smelt and winter-run chinook salmon. This study, completed in January 1996, investigated restoring the study area to wetland habitat. The Corps is currently negotiating the purchase of Little Holland tract. No non-Federal sponsor has been identified for Liberty Island. However, USFWS is negotiating with willing sellers to acquire Liberty Island as part of the proposed North Delta National Wildlife Refuge.

## **OTHER AGENCIES**

### **North Delta Project**

The U.S. Fish and Wildlife Service (Service) is in the process of planning the North Delta National Wildlife Refuge, an addition to the National Wildlife Refuge System. A Preliminary Project Proposal was submitted to the Director of USFWS, and the Service received concurrence to proceed with planning and environmental compliance for the refuge in 1997. The refuge would likely encompass Prospect Island, Liberty Island, and Little Holland Tract. A draft Environmental Assessment is currently being prepared to address the establishment of the proposed North Delta National Wildlife Refuge. The draft EA is scheduled for release in April 1999, the final EA in June 1999, and the Record of Decision to be signed in July 1999. Shortly after the completion of all the environmental documents,

the Service expects to acquire the first property (Liberty Island), thereby establishing the North Delta National Wildlife Refuge.

## **STUDY PARTICIPANTS AND COORDINATION**

A multidisciplinary team in the Corps Sacramento District, other experts in various biological and engineering fields, and local interests participated in the preparation of this ERR. Team members made site visits to verify site conditions, determine the need for habitat restoration, and formulate possible alternatives.

Early in the study, the Corps met with many separate interest groups including the Service, Reclamation, Bureau of Land Management (BLM), NMFS, DWR, the Assembly Bill 360 (AB 360), CALFED, and Category III, Wildlife Conservation Board, DFG, Port of Sacramento, Solano County Water Agency, TPL, and private landowners. Category III is a program under CALFED which funds projects addressing nonflow environmental effects such as unscreened water diversions; municipal, industrial and agricultural pollution; overfishing and illegal fishing; fish passage barriers; and habitat degradation. The AB 360 program, a program under DWR and DFG, was authorized by the California Delta Flood Protection Act of 1996 and funds mitigation and habitat improvement associated with Delta levee maintenance. A multiagency panel including the above agencies participated in the formulation of this study and met about once a month to discuss issues. Furthermore, consultations were held with other participants including Ducks Unlimited, Wildlife Conservation Board, Department of Boating and Waterways, University of California at Davis, Aquatic Habitat Institute, and Coastal America.

## CHAPTER 2

### EXISTING CONDITIONS

The following discussion is limited to existing conditions that directly affect the project formulation. Additional information on existing conditions that affect the project formulation directly and indirectly can be found in the Environmental Assessment/Initial Study (EA/IS), which is incorporated into and made a part of this ERR (Appendix K).

#### TOPOGRAPHY

Prospect Island, similar to the rest of the Delta, is generally flat with manmade levees encircling the island. The terrain gradually slopes upward at the northern and northeastern portions of the site. The terrain elevations range from 2 feet above mean sea level (msl) at the northern end of the site to -5 feet msl at the southern end. Levee heights range from about 10 to 17 feet above msl. The Miner Slough channel bottom, adjacent to Prospect Island, is at an average elevation of about -20 feet msl.<sup>2</sup>

#### SOILS

The Delta began to take on its present form during the end of the last glacial period about 11,000 years ago as the sea began to rise, filling the alluvial valley of the Sacramento River. Rivers and streams draining into the area formed a complex network of channels, islands, and sloughs. Alluvial materials accumulated along the banks of channels, forming natural levees around islands. Spring rains and high tides caused floods which easily overtopped these natural levees, forming a network of large, shallow lakes. Highly productive soils formed behind these levees as detritus from marsh areas accumulated and as nutrient-rich sediments and detritus were deposited by floodwaters.

Soils in the Delta range from a variety of alluvial fan deposits to organic peats. Organic soils are associated with freshwater marshes and river channels. Mixed mineral and organic soils and accumulated mineral sediments are found in elevated and drained areas.

Soils in the project area include Sacramento silty clay loam, Ryde clay loam, Columbia fine sandy loam, Valdez silt loam, and dredged spoil. The ground-water table varies between 1 and 4 feet in depth, and the coefficient of permeability ranges from 0.2 foot to 10 feet per day. In the dredged spoil area south of the project area, ground water is believed to be about 4 feet below the surface. Organic soil including peat varies in thickness from 2 feet at the north end of the island to 21 feet at the south end (Appendix F).

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<sup>2</sup> Murray, Burns, and Kienlen, Levee survey of RD 1667, August 1989.



## HYDROLOGY

Water elevations in the study area are influenced by hydrological events. Rapid melting of snowpacks and rains in the tributary area may greatly influence the waterways in the area. Tidal action is another factor which may influence the water action. Also, regional ground water is naturally high.

The tidal elevation data for the southern tip of Prospect Island are as follows:

Tidal Elevations	
	Feet msl
Mean high-high	4.1
Mean high	3.5
Mean	2.0
Mean low	0.2
Mean low-low	-0.3

## WATER SUPPLY

Availability of water supplies at the Delta varies with natural conditions and upstream development. Natural hydrologic variations cause extreme fluctuations in monthly and yearly inflows. Winter floods produce Delta flow rates of several hundred thousand cubic feet per second (cfs), while summer conditions can decrease rates to a few thousand cfs. The total annual volume of inflow can also vary substantially.

## HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE

During the Bureau of Reclamation's site inspection, potentially hazardous toxic, and radiological waste (HTRW) material were not present during the survey. The Reclamation ensured all cleanup were made prior to the purchase of the property in January 1995.<sup>3</sup>

## FLOODING

Unlike neighboring islands in the northwestern Delta, Prospect Island is flooded more frequently because of the relatively low heights of the ship channel and Miner Slough levees. These levees were intentionally constructed low to allow Prospect Island to flood before surrounding islands to the north and east. Stated in the 1993 "Sacramento San Joaquin Delta Atlas," by DWR, Prospect Island was flooded in 1980, 1982, 1983 and 1986. Again in 1995, and 1997. Prospect Island flooded in January

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<sup>3</sup> Personal communication, Will Keck, US Bureau of Reclamation, January 1999.

1997 when levees breached in three places and overtopped in various other spots. A breach on Miner Slough on Reclamation property was repaired by the agency in November 1997.

Under nonflood periods, Prospect Island levees allow the island to remain dry. The levees which line the perimeter of Prospect Island protect the property from flooding up to a certain height. The Prospect Island levees were intentionally designed to be lower than levees on adjacent properties so that Prospect Island would flood before those areas and accommodate floodflows (Sacramento River, California, letter from Secretary of War, 79<sup>th</sup> Congress, 2<sup>nd</sup> Session, 1946). The levees on Prospect Island are lower than levees on islands immediately to the north, land that was formerly part of Little Holland Tract, as well as lower than the west levee of Ryer Island. The ship channel levee on the west side of the island is maintained by the Corps. The other levees are maintained by the landowners (formerly Reclamation District 1667 and now the Bureau of Reclamation).

The two other breach repairs were funded by CALFED. The project scope included repairing the Port of Sacramento's levee breach, dewatering the island, and repairing the cross levee breach. The breach along the Port's property levee on Miner Slough was repaired in November 1998. The 700-foot-long breach on the cross levee separating the Reclamation's and Port's property was repaired in January 1999. Complete dewatering of the island will occur by the spring of 1999.

## POPULATION

Prospect Island is in Solano County. The total population for Solano County as of January 1996 was 373,100. According to the State Department of Finance, Solano County's population will reach 520,900 by the year 2020, a growth rate of 28 percent. Solano County has one city near the study area, Rio Vista. In 1993, the population of Rio Vista was 3,690. There are no permanent inhabitants on Prospect Island, but there is a marina northeast of the island at Five Points. In addition, two landowners have legal access (one by boat and the other by road across Reclamation property) to their property located along Prospect Island levees. Sacramento, Rio Vista, and Clarksburg are the closest populated areas to Prospect Island.

## LAND USE

The Delta is one of the most fertile areas in California. The majority of the Delta is used for agricultural production. Land use on Prospect Island is typical of the Delta in that it has been almost exclusively agricultural. The island has been used for row crops and grain production, however, the Reclamation's property on Prospect Island has not been farmed since 1994, and the Port's property on Prospect Island has not been farmed since 1986.

The ship channel, which lies to the west of Prospect Island, allows oceangoing vessels to access the Port. Commodities requiring both deep and shallow-draft vessels are moved along the ship channel.

## CULTURAL RESOURCES

Much of the prehistoric cultural record in the study area has been altered or destroyed by agricultural operations. The area was first visited by Euro-Americans in 1776 during a Spanish exploration of San Francisco Bay. During the early 19th century, trappers frequented the Delta. After completing the Central Pacific Railroad, Chinese laborers reclaimed the Delta marshland by constructing levees. This reclamation resulted in agriculture being dominant in more recent history.

The project site has not been previously surveyed for cultural resources although the southern portion of Prospect Island and levees along the ship channel have been surveyed. There are several farm buildings or structures on the island. These buildings abandoned and dilapidated are scheduled for removal. Reclamation has evaluated the buildings and determined that they are not eligible for the National Register of Historic Places. The State Historic Preservation Officer has concurred with that determination. Also, a power line on wooden poles crosses the island to a power distribution tower located close to the ship channel levee. A records check was requested from the Northwest Information Center for previously identified cultural resources sites. No sites were identified during the records check.

## FISH RESOURCES

Currently, the study area provides significant shallow water habitat for fishes only during major flooding. At such times, the flooded island likely contains the same species as the Sacramento River and other flooded islands. The Cache Slough Mitigation Area, a 176-acre tract near Prospect Island at the confluence of Cache and Shag Sloughs, was sampled by the Service several times in 1992 and 1993. The most common of the 23 species collected from this site included (in order of decreasing abundance) inland silverside, yellowfin goby, threadfin shad, hitch, Sacramento squawfish, prickly sculpin, Delta smelt, bigscale perch, fathead minnow, and mosquitofish. One specimen each of splittail and chinook salmon was also identified in Cache Slough. Splittail have also been captured at the northern end of the ship channel during routine DFG sampling.

Anadromous fish species in the Sacramento River and deeper channels (greater than 12 feet deep) of the Delta include chinook salmon, steelhead, striped bass, American shad, white sturgeon, and Pacific lamprey. The more common warmwater fishes of these deep- water areas are largemouth bass, crappie, white and channel catfish, bluegill, tule perch, Sacramento squawfish, Sacramento sucker, and other sculpins and minnows such as observed in Cache Slough. The Service sampled the ship channel in 1994 and found chinook salmon, striped bass, American shad, largemouth bass, white catfish, channel catfish, bluegill, carp, and Sacramento squawfish.<sup>4</sup>

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<sup>4</sup> U.S. Fish and Wildlife Service, "Draft Quarterly Report (June through August, 1994), Sacramento River Fish Migration Study," September 1994.

Intensive fish sampling within the flooded interior of Prospect Island occurred during October through November of 1998. The Corps was required by the National Marine Fisheries Service (NMFS) to implement a fish recovery program to fulfill the requirements for an endangered species Biological Opinion and Streambed Alteration Permit. The recovery plan was coordinated with NMFS and the Department of Fish and Game (DFG). The objectives of the fish sampling were to determine whether any of the listed or proposed threatened or endangered species were present. The proposed threatened or endangered species list consisted of Sacramento River winter run chinook, Central Valley steelhead, Central Valley spring run chinook, Central Valley fall chinook, Sacramento splittail and Delta smelt. None of the target species were found during the sampling.

## VEGETATION/WILDLIFE HABITAT

For two years, during the flooded conditions, the non-tidal open water cover type has diminished since its flooded condition for the last two years due to the draining operations that was performed during the September and October months of 1998. The study area has nine existing cover types: upland, non-tidal open water (ditches, drains, and canals), riparian forest, riparian scrub-shrub, non-tidal emergent marsh, shallow flood cover, SRA cover, agriculture, and bare ground (Appendix K).

The ship channel and Miner Slough levees are riprapped. The large rock riprap applied to the ship channel supports no vegetation. However, a bench of up to 40 feet wide is present outside the levee toe on the northern two-thirds of the ship channel. Stands of mature cottonwoods and willows are growing on the benches. Smaller trees, primarily willows up to 15 feet high, and shrubs such as blackberry grow through the riprap along the outer slope of the Miner Slough levee.<sup>5</sup> About two-thirds of the outer perimeter of the site is covered with early successional and mature riparian or riparian shrub-scrub vegetation.<sup>6</sup>

The soil on Prospect Island is rich and fertile. The island has been farmed with crops including corn, safflower, sugar beets, and wheat. There are also a few interior roads and numerous irrigation ditches, drains, and canals. These are generally free of vegetation, although a few, very small, scattered patches of young willow shrub-scrub and emergent marsh are present, remnants of when the island was flooded. Agricultural vegetation provides little wildlife habitat value.

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<sup>5</sup> U.S. Fish and Wildlife Service, Prospect Island "Planning Aid Report," January 1995.

<sup>6</sup> California Department of Fish and Game and the U.S. Fish and Wildlife Service, "Sacramento/San Joaquin Delta Wildlife Habitat Protection and Restoration Plan," December 1990.

## WILDLIFE

Although there is little natural habitat at the project site on Prospect Island, the riparian areas along the levees likely provide forage, cover, and nest sites for some plant and wildlife species. Animals which depend on such areas include belted kingfisher, rufous-sided towhee, ringtail, and some wading birds, such as the great blue heron, which nest in riparian trees.

Bird species that may use the levees include California quail, mourning dove, common crow, yellow-billed magpie, ring-necked pheasant, and raptors. Waterfowl using the island include Canada goose, mallard, wood duck, and common merganser.

## SPECIAL STATUS SPECIES

A list of the Federally listed threatened, endangered, and proposed species was received from the Service for the Liberty Island and Rio Vista USGS quadrangle maps in July 1997 and updated in April 1998. According to the species list in the April letter, the Federally listed species that may occur in or be affected by projects in the study area include the American peregrine falcon, Aleutian Canada goose, bald eagle, giant garter snake, California red-legged frog, winter-run chinook salmon and its critical habitat, delta smelt and its critical habitat, Central Valley steelhead, Conservancy fairy shrimp, vernal pool tadpole shrimp, vernal pool fairy shrimp, valley elderberry longhorn beetle, and delta green ground beetle. Federally listed plants that are on the Solano County list and may occur in the project area include Suisun thistle, salt marsh bird's beak, soft bird's beak, Contra Costa goldfields, Solano grass, and Colusa grass. The Federally proposed species include the riparian woodrat, riparian brush rabbit, Central Valley spring-run chinook salmon and its critical habitat, Central Valley fall-run chinook salmon and its critical habitat, and Sacramento splittail. In addition, two candidate species and 41 species of concern were included on the list.

A search of DFG's Natural Diversity Database (NDDDB) revealed no occurrences in the project area of the American peregrine falcon, Aleutian Canada goose, riparian woodrat, riparian brush rabbit, giant garter snake, California red-legged frog, Conservancy fairy shrimp, vernal pool tadpole shrimp, vernal pool fairy shrimp, delta green ground beetle, and any of the listed plants. In addition, there is no suitable habitat in the project area for these species. Potential roosting habitat for bald eagles, and elderberry shrubs, the host for the valley elderberry longhorn beetle, were found in the area. The NDDDB search did reveal three State species in the vicinity of the project area: Mason's lilacopsis, Delta tule-pea, and Swainson's hawk. Foraging habitat for the Swainson's hawk occurs in the project area.

The listed and proposed fish species and their critical habitat which are likely to occur, at least occasionally, in the vicinity of the project area include the Sacramento splittail, Sacramento river winter-run chinook salmon and its critical habitat, Central Valley steelhead, delta smelt and its critical habitat, Central Valley fall-run chinook salmon and its critical habitat, and Central Valley spring-run chinook salmon and its critical habitat.

## RECREATION

Since portions of Prospect Island are Federally or privately owned and historically used for agriculture, there is very little recreational use of the island. Prospect Island may occasionally be trespassed for activities such as fishing access to the ship channel. Although the ship channel is used by recreational boaters, there are no recreational facilities such as docks, launching areas, picnic grounds, or restrooms on the ship channel near Prospect Island. Recreational boaters use Miner Slough, and one commercial marina, the Arrowhead Harbor, which is located on Miner Slough at the northeastern corner of Prospect Island.

Recreational opportunities near Prospect Island are few because of limited public recreation facilities, as well as private levees and farmlands surrounding public waterways.



## CHAPTER 3

### ENVIRONMENTAL PROBLEMS AND OPPORTUNITIES

#### GENERAL ENVIRONMENTAL PROBLEMS

##### Wetland Habitat

Wetlands comprise one of the Earth's most productive natural systems. At the time of the Gold Rush in 1849, California had 5 million acres of wetlands, mostly in the Central Valley. Most of these wetland areas were surrounded by grasslands and riparian areas that provided ideal wintering and breeding habitat for waterfowl, shorebirds, and other wildlife that flourished throughout the region.<sup>7</sup> Migratory waterfowl relied on these wetlands for important resting and refueling during their passage southward. These wetlands provided a wide variety of other benefits including fish rearing and passage, ground-water recharge, and sediment control.

In California, only 6 percent of its pre-Gold Rush wetlands remain.<sup>8</sup> Wetland habitat has continued to decline from the original 4 million acres once present in the Central Valley to approximately 290,000 acres today. In the Central Valley, 95 percent of the historic wetlands have been lost.

The Delta, situated in the middle of the Central Valley, occupies a key position on the Pacific Flyway, a major migratory route used annually by waterfowl and other birds. Historically, the Delta was an extensive mosaic of wetland complexes. These complexes provided river habitats ranging from riparian forests at higher elevations to freshwater tidal marshes near msl. Tule marshes were also common. The Delta typically flooded between December and May, providing foraging habitats for migrating and wintering birds. These wetlands constitute the most important wintering area for waterfowl on the Pacific Flyway, supporting more than 60 percent of the total population. These wetlands are vital to the continued viability of waterfowl populations on the Pacific Flyway.

Reclamation of some 60 wetland islands and the accompanying construction of thousands of miles of levees created valuable agricultural areas, but destroyed the extensive marshland habitat so valuable to waterfowl. Flooded agricultural fields partially duplicate the functional values of the marshes and seasonally flooded areas of the pre-reclamation Delta.

No other state has suffered such a loss of wetlands. Currently, there are only 17,000 acres of wetlands, including permanently flooded, seasonal, and tidal estuarine habitat left in the Delta.<sup>9</sup> Key

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<sup>7</sup> Central Valley Habitat Joint Venture, "Implementation Plan -- A Component of the North American Waterfowl Management Plan," February 1990.

<sup>8</sup> U.S. Environmental Protection Agency, "Welcome to the Wetlands," Publication, March 1991.

<sup>9</sup> California Department of Fish and Game, California Wildlife Conservation Board, "California Wetland and Riparian Geographic Information System Project Final Report," January 1997.



waterfowl habitat today consists primarily of flooded agricultural fields.<sup>10</sup> Natural wetlands are limited to several channel islands and the Stone Lakes and Cosumnes River Preserve areas. This project would increase wetlands in the Delta significantly by providing tule marsh, mudflat, and riparian habitat.

### **Riparian Habitat and Shaded Riverine Aquatic Cover**

Before European settlement, over 950,000 acres of riparian habitat existed in the Central Valley. However, urbanization, land reclamation, and water resources development in the valley have reduced this historic acreage dramatically. Although efforts are being taken to reduce losses and restore the condition of existing riparian habitat, the decline in habitat quality and diversity continues.

Shaded Riverine Aquatic (SRA) is defined by the Service as

...the nearshore aquatic area occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this cover type include: (a) the adjacent bank being composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes into the water, and (b) the water containing variable amounts of woody debris, such as leaves, logs, branches and roots, as well as variable depths, velocities and currents.<sup>11</sup>

In accordance with their Mitigation Policy, the Service has determined that categorization of SRA Cover as Resource Category 1 is appropriate for selected reaches of the Sacramento River system. The goal of Resource Category 1 is no loss of existing habitat value, acreage, and riverside length.

Overhanging riparian vegetation, exposed riverbank tree roots, and undercut banks provide protective cover for fish. SRA is important because it provides cover to many aquatic organisms, including fish. Because it moderates water temperatures, SRA is very important for salmon. The overhanging vegetation provides food and habitat for both terrestrial and aquatic invertebrates, which provide food for numerous bird and fish species including the endangered winter-run chinook salmon. However, this cover type on the Sacramento River and its major tributaries has been rapidly lost over the past 30 years. As a result, the Service estimates that only 7 percent of historic SRA cover remains in the lower Sacramento River and its four major sloughs.<sup>12</sup>

The loss of riparian habitat affects other wildlife species. With high species diversity, diversity in plant heights, dense cover, high plant productivity, and ample water, riparian areas are probably the

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<sup>10</sup> California Department of Fish and Game, "Delta Wildlife Habitat Protection and Restoration Plan," December 1990.

<sup>11</sup> U.S. Fish and Wildlife Service, "Shaded Riverine Aquatic Cover of the Sacramento River System: Classification as Resource Category 1 Under the FWS Mitigation Policy," October 1992.

<sup>12</sup> U.S. Fish and Wildlife Service, "Shaded Riverine Aquatic Cover of the Sacramento River System: Classification as Resource Category 1 Under the FWS Mitigation Policy," October 1992.

most important habitats for wildlife in the west. A great variety of wildlife, including many threatened and endangered species, depends on these areas. Songbirds, raptors (including the bald eagle), various waterbirds, waterfowl, and small mammals use this habitat extensively for feeding, nesting, resting, and escape cover.

Many wildlife species depend exclusively on riparian habitat and do not use other habitats. Overall, about 25 percent of native terrestrial mammal species, 50 percent of reptile species, and 75 percent of amphibian species in California depend on riparian habitat. More bird species depend on riparian habitat than on any other habitat in California.

In addition to providing habitat for animals, wetland and riparian systems also perform a number of important hydrologic functions and contribute to socioeconomic values. As part of the natural flood plain, wetland and riparian systems function as water filters. They also detain and gradually release floodwater. Wetland and riparian areas provide ground-water recharge basins, bank stabilization, water pollution purification, and erosion control.

Historically, the Delta region had abundant riparian and SRA growth. When the land was converted to valuable agricultural areas and levees, much of the riparian growth was cleared. Now, the last vestige of old growth riparian forest is in the Cosumnes River Preserve, operated by The Nature Conservancy.

### **Fish Habitat**

The populations of several species of native fish that use the Delta for some or all of their life cycles have experienced serious decline including the following threatened and endangered fish: the Sacramento splittail, Delta smelt, Central Valley steelhead, and Central Valley spring-run, fall-run, and winter-run chinook salmon.

Sacramento splittail are endemic to California. They were once abundant throughout the Central Valley. However, their numbers have declined. They require flooded vegetation for spawning and foraging areas for the young. Water diversions during the spawning season and limits on migration posed by dams and other diversions coupled with reduced outflow, drought, introduced aquatic species, and the loss of wetlands and shallow-water habitat appear to have contributed to the decline of the splittail.

Although the Delta smelt was one of the most common Delta fish until as recently as the 1970's, this smelt has declined significantly in the past 10 years. Factors believed to have contributed to the decline of this species include (1) low Delta outflow which decreases habitat, (2) decrease in water quality caused by influences of irrigation drainage water, and (3) competition with nonnative species.

Central Valley, spring-run, fall-run, and winter-run chinook salmon populations have been declining at a rapid rate. River channel modifications, construction of barriers (dams and diversions),

and loss of spawning and rearing habitats are thought to be major factors contributing to the decline of chinook salmon.

### **Effects of Corps Projects**

Construction and operation of the Sacramento River Deep Water Ship Channel near the study area have resulted in the disposal of dredged material in wetlands and resulting loss of riparian, upland, and emergent marsh vegetation. Initial construction of ship channel levees on Prospect Island also resulted in the loss of natural vegetation. Features of the ship channel are described in more detail in the Existing Water Resources Projects section of Chapter 1. Maintenance activities since the construction of the ship channel along the west side of Prospect Island have resulted in this irreplaceable loss of habitat. Since Prospect Island remains an active and functioning part of the Yolo Bypass, which is within the Sacramento River Flood Control Area, continued required maintenance has contributed to habitat degradation.

Construction of levees associated with the Sacramento River Flood Control Project in the study area resulted in the loss of waterside and landside riparian vegetation. Loss of waterside vegetation also affects wildlife because riparian, shrub-scrub, and emergent marsh vegetation are removed. Landside vegetation removal affects wildlife because upland forest, scrub-shrub, and agricultural habitats are no longer available for wildlife use. Typically, vegetation is removed from bank protection activities as part of the maintenance regime for erosion control or from levee improvement activities that require raising and widening existing levees. Maintenance requirements such as levee burning restrict vegetative growth on levees and rock revetment. These requirements result from Corps levee maintenance regulations that require that project levees be maintained free of vegetation. Levee burning and other clearing practices minimize the colonization and growth of vegetation.

### **MAINTENANCE COSTS**

The Corps has been maintaining the Prospect Island levee along the ship channel as part of the ship channel project. The cost of maintenance previously averaged \$212,000 annually to place rock revetment and protect the ship channel levee along Reclamation's property against erosion. The rock revetment protects Prospect Island levees to the west.

Currently, the levee along the west side of Prospect Island is riprapped over about one-third of its total length. The narrow width of the channel and large size of passing ships in the channel cause substantial bank erosion and necessitate the placement of larger and more expensive rock on the levee. The Corps has started to place larger rocks because some of the older rock sites have failed.

## OPPORTUNITIES

Prospect Island presents a prime opportunity to restore wetland, shallow open water, riparian, and SRA habitat in the Delta. Agency interest in restoring Prospect Island is high. Prospect Island has been identified by CALFED as a desired location for habitat restoration. Through Category III, funding has been made available specifically to pay for the non-Federal share of the Prospect Island project. Further funding has been proposed through the AB 360 program, a program administered by DWR and DFG that assists Reclamation Districts with levee maintenance. Furthermore, Prospect Island has experienced minimal subsidence. While some islands in the Delta are at -20 feet below sea level, Prospect Island ranges from 1 foot above sea level to -4 feet below sea level. Therefore, when flooded, Prospect Island will be under zero feet to 7 feet of water, good depths for creating wetland and shallow open water habitat, while other islands would be under 25 feet of water when flooded.

### Habitats

Specifically, there are opportunities to restore the following habitats on Prospect Island:

Wetland Habitat. In the past, wetlands were drained and converted to productive uses such as farming. In recent years, people have begun to realize the value of wetlands for supporting important fish and wildlife resources, improving water quality, and providing recreational opportunities. Today, there is increasing public support for restoring wetlands. The California Legislature has passed Concurrent Resolution 28 calling for the expansion of the State's wetlands by 50 percent by the year 2000. The construction of wetland habitat at Prospect Island will help the State reach this goal.

SRA Habitat. Because of the abundance of water-riverbank interface that would result from a restored Prospect Island, there is a high potential to create SRA habitat which may be beneficial to anadromous fish and other fish and wildlife.

Fish Habitat. Prospect Island is near the Cache Slough Mitigation Area, a known spawning area for Delta smelt. This species prefers shallow waters with good tidal action. Given the scarcity of this type of habitat in the Delta, any restoration of shallow water habitat, such as on Prospect Island, would provide habitat which may be beneficial for spawning and rearing. Sacramento splittail may also benefit from a Prospect Island restoration project.

The northern Delta is believed to be an important rearing habitat for winter-run chinook salmon during wet years. A Prospect Island restoration project could provide valuable rearing habitat for salmon on their way to the sea. SRA habitat developed on the island would provide valuable food and cover. Furthermore, a restored Prospect Island could assist anadromous fish to reenter the Sacramento River system through Miner Slough rather than to continue up the ship channel.

## **Maintenance Cost Reduction**

The 1946 act authorizing the ship channel recognizes the Corps' responsibility for bank protection at Prospect Island. Constructing a wetland on Prospect Island, breaching the levee, and abandoning maintenance of the levee would allow the Corps to reduce ongoing costs incurred by maintaining the ship channel. Annual Federal O&M funds currently expended to maintain a portion of the levee at Prospect Island could be eliminated if a wetland is created. The Corps would no longer have O&M responsibilities for the ship channel levee along Reclamation's property on Prospect Island.

Since completion of the ship channel in 1963, erosion of the channel has necessitated relatively frequent and extensive rock bank protection to maintain levee integrity. Restoring Prospect Island would minimize the need to maintain the levee.

## **FUTURE WITHOUT THE PROJECT**

Although Reclamation could determine that Prospect is excess land and could sell Prospect Island, it is projected that under without-project conditions, Reclamation would continue to own the land. In addition, Reclamation has no plans to restore habitat on Prospect Island. The site would continue to hold its current habitat values (under dry conditions). Wetlands and SRA habitat would continue at their low levels in the Delta.

Under without-project conditions, no action would be taken by the Federal Government to improve the environmental values of Prospect Island. The without-project assumptions related to the existing navigation and flood control facilities and current land use are:

- The island would continue to flood periodically during flood events. Levee repairs and pumping would be required to reclaim the island for agriculture.
- The land would continue to be owned by Reclamation and leased out for agriculture.
- No habitat restoration features would be constructed.
- The Corps would continue maintenance of the ship channel levee on Reclamation's property at Prospect Island.

## **CHAPTER 4**

### **PLAN FORMULATION**

#### **FORMULATION PROCESS**

The study involved extensive coordination with project partners, hydraulic and soils engineers, fish and wildlife biologists, and landscape architect field design experts in habitat restoration. After conducting initial research on tidally influenced freshwater wetlands, the Corps, with input from the Service, formulated a series of preliminary alternatives, which were then reviewed by the Service and other experts. Next, a final array of alternatives was formulated by refining the preliminary alternatives. The recommended alternative was developed based on the alternatives and results of the technical studies on soils, hydrology, hydraulics, surveys, costs and habitat values.

#### **RESTORATION OBJECTIVE**

The objective of an environmental restoration project is to restore degraded ecosystem structure, function, and/or dynamic process to a less degraded, more natural condition. Opportunities to achieve this objective were based on the baseline conditions, restoration planning authority, and results of environmental and related resource studies.

Consistent with the restoration needs and opportunities described in Chapter 3, the following planning objectives were established for the formulation and evaluation of alternative plans:

- Create habitat that is beneficial for Federally listed threatened Delta smelt and proposed threatened Sacramento splittail on Prospect Island,
- Create habitat that is beneficial for feeding, cover, and resting areas for anadromous fish on Prospect Island,
- Improve waterfowl and shorebird habitat conditions on Prospect Island, and
- Provide terrestrial and aquatic habitat for other wildlife species.

#### **PLANNING CONSTRAINTS**

Specific constraints include the following:

- Implementation of restoration must not expose the flood control project levees to increased erosion or other damage.

- Implementation of restoration must not adversely affect operation of the ship channel.
- Implementation of restoration should reduce Corps maintenance costs on the ship channel without jeopardizing the integrity of the levees protecting Little Holland Tract or Ryer Island.
- Implementation of restoration must help stabilize the Miner Slough levee and cross levees on Prospect Island against wave wash and other types of erosion to protect Little Holland Tract, Ryer Island, and the Port's property at the southern tip of Prospect Island.
- Implementation of restoration shall not adversely impact the land use activities on adjacent islands.

## ENVIRONMENTAL RESTORATION CRITERIA

Environmental restoration for this study targets shorebirds, waterfowl, and three species of fish, delta smelt, splittail, and salmon. Shorebirds and waterfowl are indicator species of ecosystem health in the Delta and are of national concern. The three species of fish are also indicator species in the Delta and are Federally listed. Prospect Island was designed to restore habitat that may be beneficial towards meeting at least some of the targeted habitat criteria. The habitat requirement criteria are described below and are summarized in Table 1.

## HABITAT RESTORATION COMPONENTS

### Water Surface

The following design components are to be part of any restoration alternative. Design of project features is to include a mean high-high tide of 4.1 feet msl (based on the 1929 National Geodetic Vertical Datum), a mean high tide of 3.5 feet msl, a mean water level (mwl) of 2.0 feet msl, a mean low tide of 0.2 feet msl, and a mean low-low tide of -0.3 feet msl. Tides were determined by considering 19 years of record at the Rio Vista tidal gage and using those values adjusted for location for the Prospect Island site.

Table 1. Target restoration habitat types and criteria	
Habitat Type	Restoration Criteria
Smelt Habitat	<ul style="list-style-type: none"> <li>• Shallow water (3 to 8 feet deep, no more than 11 feet deep) along the edges of rivers, channels, and sloughs.</li> <li>• Shoal regions containing submerged substrate such as vegetation, rocks, and roots.</li> <li>• Dead-end sloughs.</li> </ul>
Sacramento Splittail	<ul style="list-style-type: none"> <li>• Riparian areas.</li> <li>• Dead-end sloughs.</li> <li>• Newly flooded vegetation.</li> </ul>
Salmon	<ul style="list-style-type: none"> <li>• Migratory resting corridor with deep pools for juvenile salmon to mature while migrating downstream from Miner Slough.</li> <li>• SRA to provide cooling, cover, and terrestrial insects. SRA would improve the nursery value of the Delta and could lead to improved survival and natural production upstream. The largest benefit to anadromous fish would be the contribution of detritus and food to juvenile fish.</li> <li>• Open water to provide crustaceans for juvenile salmon.</li> </ul>
Waterfowl	<ul style="list-style-type: none"> <li>• Tule marsh to provide nesting habitat for dabbling and diving ducks. Tule marsh is used extensively by diving ducks and other crustacean and fish-eating birds such as grebes, coots, and great blue heron. All waterfowl except for some diving ducks prefer marsh habitats.</li> <li>• A covering of water 3 feet deep or less and/or emergent vegetation over 40 to 85 percent of the site (optimal percent cover is 60 to 85 percent).<sup>13</sup></li> <li>• Mudflat and SRA habitat to provide a source of invertebrates, especially during winter.</li> <li>• Open water to provide loafing areas safe from predators.</li> <li>• Upland habitat to provide escape and nesting cover and food for breeding waterfowl.</li> <li>• Nesting islands with upland vegetation.</li> </ul>
Shorebirds	<ul style="list-style-type: none"> <li>• Mudflats flooded to depths of zero to 2 inches.<sup>14</sup> Mudflats provide invertebrate food source required by shorebirds.</li> <li>• Loafing areas located near mudflats.</li> <li>• Optimal shorebird habitat more than 150 feet from disturbance (such as footpaths).<sup>16</sup></li> <li>• Nesting and loafing habitat, including nonvegetated or sparsely vegetated islands.</li> </ul>

<sup>13</sup> U.S. Fish and Wildlife Service, "Habitat Suitability Index Model for Greater White-fronted Goose (Wintering)," July 1986.

<sup>14</sup> U.S. Fish and Wildlife Service, "Habitat Suitability Index Model for Shorebird Guild," July 1986.



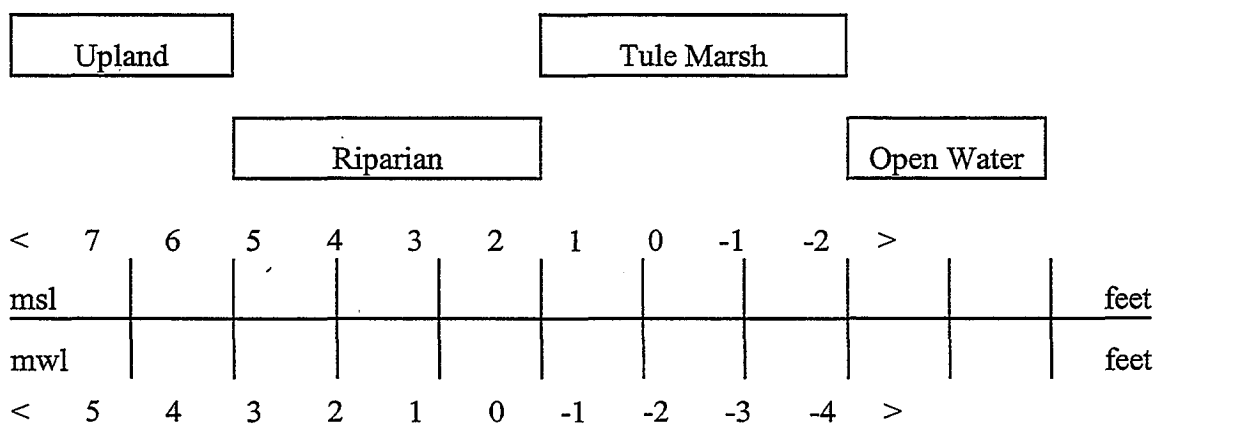
## Environmental

Cover Types. In a tidal freshwater wetland, different vegetative cover types grow only at certain elevation ranges relative to the tide cycle. For example, tule marsh vegetation grows primarily between 2 feet below and 1 foot above mwl. Because landforms with elevations suitable for the target cover types would be created, earth moving is included as a restoration component. Portions of Prospect Island would be excavated and the excavated material used to create islands, perimeter berms for riparian vegetation, and more gradual slopes on existing levees. The excavation would take the form of a channel through Prospect Island, connecting two levee breaches. Dredged material from concurrent maintenance of the ship channel could also be used.

This study used the elevations for the target cover types that were presented in the "Design and Biological Monitoring of Wetland and Riparian Habitats Created with Dredged Materials - Final Report - Deep Water Ship Channel Monitoring Program," September 1990 (Table 2).

1. Open water - below -1.0 msl.
2. Tule marsh - from about -1.0 foot to 3 feet above msl.
3. Riparian and SRA - from about 3 to 6 feet above msl or higher in peat soils.
4. Upland - above 6.0 feet msl.

Table 2. Elevations of different cover types



The quantity of these cover types can be varied by controlling the slopes of both created islands and levee slopes. Furthermore, submergent vegetation which grows from about -1.0 foot to 2.0 feet msl can support waterfowl puddling feeding crops such as arrowheads (*Sagittaria* spp.) and pond weeds (*Potamogeton* spp.) Deep pockets of standing water can strand fish at low tides if fish enter pools during high tide and are unable to escape at low tide because the entrance channels have become exposed. The project has been designed to prevent fish stranding by avoiding deep pockets of standing water at low tide. Furthermore, maximal tidal exchange was created, eliminating "dead water" zones where "water quality may deteriorate and/or predators may accumulate," as was recommended by the Service's February 22, 1995, Planning Aid Report for Prospect Island. Furthermore, the site is sloped towards the levee breaches to ensure drainage. The slope is consistent, and there would be no potholes that would retain water and strand fish. As the tide shifts from high to low, fish would be carried out of the island gradually, towards the breaches.

Vegetation. The development of target cover types can be assisted by planting vegetation on Prospect Island. At Donlon and Venice Cut Islands, interior islands were developed and allowed to colonize naturally.<sup>15,16,17,18</sup> Although this approach was successful, habitat values can be developed more quickly by planting. Portions of the Cache Slough/Yolo Bypass mitigation site were allowed to colonize. Portions of the site were planted to act as seed sources for natural habitat development. Since 1992, when the levees were breached, the habitat that has developed has largely been the result of natural colonization. Relying on natural colonization has been a successful strategy at the Cache Slough site. Weeds, primarily star thistle, have invaded, but have been limited primarily to the upland areas of the levee crowns where the soils have limited volunteer growth. Weed abatement would be a part of the Operations and Maintenance program for the Prospect Island project. Natural colonization, which can also be applied to Prospect Island, is a key element of the project.

Levee Breaches. Constructing breaches in the existing perimeter levees would allow full tidal action to return to Prospect Island. Water would flow into Prospect Island at high tide and flow out of Prospect Island at low tide. Different cover types would develop in response to this tidal action. Furthermore, a water volume exchange ensures adequate water circulation and water quality and discourages mosquito growth. The design of the alternative plans included a 2-day exchange rate.

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<sup>15</sup> Corps of Engineers, "Design and Monitoring of Wetland and Riparian Covers Created with Dredged Materials, Deep Water Ship Channel Monitoring Programs," September 1990.

<sup>16</sup> Corps of Engineers, "Vegetation Establishment and Avian Habitat Use," 1987.

<sup>17</sup> Corps of Engineers, "Vegetation Establishment and Avian Habitat Use," 1988.

<sup>18</sup> Corps of Engineers, "Vegetation Establishment and Avian Habitat Use," 1989.

## Operations

Ship Channel Maintenance. Biotechnical bank stabilization, rock revetment, and/or a gradually sloping berm should be used to control erosion on any remaining levee sections. Maintenance of the ship channel levee should be minimal to nonexistent once the project is in place. As part of reducing Corps levee maintenance costs and justification for developing Prospect Island under the Section 1135 program, the ship channel levee would be left to erode and degrade once the project is constructed. Sedimentation buildup within the channel due to the eroding levee banks would not diminish the function of the ship channel as the Corps will continue dredging of the ship channel as a separate project.

Protection of Surrounding Lands. Little Holland Tract, Ryer Island, and non-project land on Prospect Island should be protected. The levees along the western side of Miner Slough need to be stabilized to avoid any increased maintenance needs for the nearby flood control project levees along Ryer Island and the east side of Miner Slough. Levees can be stabilized by (1) constructing a gradually sloping berm, rock revetment, and/or biotechnical bank stabilization to control erosion on the Miner Slough and north levees of the island and (2) constructing islands perpendicular to prevailing summer and winter winds to reduce fetch and protect the Miner Slough and north levees from wind and wave erosion.

PG&E Powerlines. A PG&E powerline on wooden poles crosses Prospect Island and connects to a power distribution tower close to the ship channel levee. The poles have fallen down and PG&E has not transmitted power across Prospect Island to a private 9-acre parcel since it was flooded in 1997. An option to reestablishing the powerlines is to purchase the parcel. Purchasing the property has the added cost-savings benefit of eliminating the need to maintain the property's right of way. Acquiring the parcel as part of the project would avoid the need to supply power to the private owner. Otherwise, either a generator would provide power to the property, or the PG&E poles would be relocated along the existing poles along Miner Slough or placed underground beneath the Miner Slough to the Ryer Island. PG&E would have to be given a new easement for the relocation of the poles if the lines are not brought underground beneath Miner Slough.

## CHAPTER 5

### ALTERNATIVE RESTORATION PLANS

#### ARRAY OF RESTORATION PLANS

Six alternative plans, including the no-action plan and five action plans, were formulated from the restoration measures. The five action plans all include restoration of SRA, riparian, tidal emergent marsh, and shallow water habitats. Each alternative also addresses the operational constraints described in the previous section. The alternatives ranged from taking no action to resolve the current environmental and related problems to developing a fully constructed freshwater tidal marsh, riparian/upland channel-island complex within Prospect Island. The plans differ in the amount of habitat types that would be restored. Details concerning the restoration planting methods and procedures are presented in Appendix B, the Basis of Design. Many alternative restoration plans, including alternatives 1, 2, and 3, were explored during the reconnaissance study.<sup>19</sup> The reconnaissance study is incorporated into this ERR by reference. Alternatives 4 and 5 were formulated based on refined studies and comments received on the reconnaissance report. Alternatives 1 and 2 are presented to help define the array of plans considered. They were not carried forward in the final array.

Following is a summary of the major features for each alternative. Relative costs, benefits, and effects are provided in the next section.

#### No-Action Alternative

Under the no-action alternative, there would be no Federal participation in environmental restoration within the study area. The without-project condition would apply. The 1,228-acre area would continue to be in Reclamation's ownership. Reclamation would likely lease the land for agriculture. Periodically, levees may breach. If not repaired promptly, uncontrolled breaches could result in erosion of levees on Reclamation's property and on other Prospect Island properties until the breaches are repaired. Agricultural activities would also be halted until the levees could be repaired and the island pumped dry. Depending on the breach location, access to private properties on Prospect Island would be temporarily interrupted until the breaches could be fixed. Activities on the private properties should not be affected.

Additional vegetation removal would continue in the no-action alternative as part of normal O&M activities. Riparian and upland habitat would likely be removed, and this limited vegetation

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<sup>19</sup> Corps of Engineers, 1995, Reconnaissance Report, Prospect Island Fish and Wildlife Habitat Restoration Study.

clearing could prevent significant increases in riparian vegetation in the system. Normal O&M might remove significant mature riparian habitat. Mature trees may be replaced with rock revetment, rendering the growth of replacement habitat difficult for many year.

Under this alternative the Corps would continue to maintain the levee along the deep water ship channel and there would be no habitat restoration.

### **Alternative 1**

Major features of this alternative are shown on Plate 1 and include:

#### **Breaching**

- Breach the island in two places, the ship channel levee on the west side of the island and Miner Slough on the east side and stabilize the breaches with rock revetment.

#### **Levee Modifications**

- Create a 5:1 levee slope from elevation zero to 5.5 feet msl on Miner Slough and both east-west cross levees.
- Use biotechnical plantings on all levees.

#### **Islands**

- Site two islands to decrease longitudinal fetch. Islands should be 6 feet high to decrease fetch lengths.
- Develop two islands near the breaches to dissipate wave energy generated by ships passing through the ship channel. Protect the portion of these islands that faces the ship channel from wave-generated erosion.
- All fill material is available on Reclamation's property.
- No constructed channel excavation is included in the design.

### **Alternative 2**

This alternative is similar to alternative 1, but with islands designed to further decrease fetch and increase habitat. Alternative 2 (Plate 2) also consists of a highly diversified channel-island complex.

#### **Breaching**

- Breach Miner Slough and ship channel levees. Stabilize breaches with rock revetment.

### Levee Modifications

- Create a 10:1 slope with 20-foot berm from elevation zero to 5.5 feet msl on the Miner Slough and both cross levees.
- Use biotechnical techniques on all levees.
- Improve the Miner Slough levee road so that access is maintained for other landowners on the island.
- Construct a bridge across the breach on the Miner Slough levee to allow passage of private automobiles and trucks.
- Plant the waterside of Miner Slough and the ship channel with SRA.

### Islands

- Vary the slope of islands to create more diverse habitat. The margins of the islands should have a 10:1 or greater slope for 40 percent of the lineal length of islands, 5:1 for 25 percent, 2:1 for 20 percent, and 1:1 for 15 percent.
- Plant all areas higher than 3.0 feet msl with riparian and upland vegetation.
- Develop an island near the ship channel breach to dissipate wave energy generated by ships passing through the ship channel.
- Make depressions within the islands to trap water at low tide, creating tule marsh habitat.
- Protect the portion of the islands near the breach along the ship channel levee from wave-generated erosion.
- Plant Miner Slough and the ship channel levees with SRA.
- Construct shorebird loafing islands ranging from 6 to 120 feet wide by a few to several hundred feet long. The islands would vary from a maximum elevation of 3 feet msl to 5 feet msl. Site these islands perpendicular to the prevailing winds. Plant the windward side with tules.
- Sources of fill material would be Reclamation's property, potentially the Port's property, and offsite materials.
- Design this alternative to maintain its high habitat values and diversity.
- No constructed channel excavation is included in the design.

### Alternative 3

Sedimentation and channel formation would affect highly developed restored wetlands. Alternative 3 (Plate 3) was developed to be a simple tidal freshwater habitat that would facilitate natural sedimentation and natural channel formation.<sup>20</sup> The primary additional feature of this plan over

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<sup>20</sup> Crone, Ray in M. Stevens and E. Rejmankova, "Cache Slough/Yolo Basin Monitoring Report," UC Davis, July 1994; Personal Communication, Josh Collins, Aquatic Habitat Institute, July 1994; Personal Communication, Scott Minor, Corps of Engineers, February 1995.

alternatives 1 and 2, as shown on Plate 2, is a flow-through channel created by excavating material from a breach in the east bank levee of the ship channel just upstream from the Port of Sacramento's property to a breach on the upstream side of the Miner Slough levee.

In addition to providing construction materials, the excavated channel would facilitate tidal action within the site. Tidal action would discourage predator fish such as silverside and striped bass. Other measures that would discourage predator fish, such as avoiding deep pockets of water over 8 feet deep and ensuring that these deep pockets receive full tidal flushing, are incorporated into the plan. Alternative 3 also includes a side channel and dead-end slough, which are preferred habitats of Delta smelt.

This plan has two breaches, one at the upstream end of Miner Slough and the other at the downstream end of the ship channel. The breach on Miner Slough allows out-migrating salmon smolt to access the site while continuing their downstream migration. A bridge would be constructed across the breach to maintain road access to the 9-acre privately owned parcel. Acquiring the adjacent parcel is an alternative to constructing a bridge across the breach. If the entire island were in public ownership, then there would be no need to provide road access for the private landowner across Prospect Island.

The breach on the ship channel side of the island would allow out-migrating salmon to migrate down the ship channel, in-migrating salmon to migrate up through Miner Slough, and the Corps to abandon maintenance on the ship channel levee. The breach would be armored to protect it during the 3-year establishment period. Thereafter, the breach would be allowed to erode.

The breaches were sized to allow a 7-day or less replacement of water. The breaches were located and designed to maintain access for private landowners and provide optimal habitat conditions for target fish species.

Alternative 3 includes long, narrow islands to further decrease fetch and maximize the water/land interface and a central channel and two side channels.

#### Levee Breaching

- Breach Miner Slough levee upstream and ship channel levee downstream. Size the breaches so that they do not require rock revetment (after the 3-year establishment period).

#### Levee Modifications

- Construct levees with a 10:1 slope and a 30-foot berm.
- Construct islands and levees with a highly sinuous interface with open water and include embankments to provide more diverse habitat.

- Construct a bridge across the breach on the Miner Slough levee to allow passage of private automobiles and trucks.

#### Islands

- Use biotechnical plantings on all islands.
- All fill material is available on property of Reclamation and potentially the Port.

#### Channels

- Excavate a 5-feet-deep by 60-100-feet-wide central channel and 5-feet-deep by 60-foot wide dead-end sloughs.

### Alternative 4

Alternative 4 (Plate 4) would be very similar to alternative 3. It was formulated with a channel and berms through Prospect Island to ensure an effective flow-through system. It does not require the removal of nearly as much material from the northern part of the island as alternative 3. The Miner Slough levee would be breached upstream, and the ship channel levee would be breached downstream. Some levee sections along the ship channel are already at a gradual slope and would require no additional protection (Figure 4). The Corps would no longer maintain the ship channel levee, and the levee would be allowed to vegetate naturally. All other existing levees would be stabilized with embankments of a 10:1 slope with a 10- to 40-foot-wide berm (Figure 5). Most islands would be contoured with a 5:1 slope and a 20-foot-wide bench (Figure 6). Barrier islands in the deeper water area would have a 40-foot-wide bench (Figure 7). A peninsula (rather than an island) was designed so that wildlife use of islands and the peninsula could be monitored in the future. Cut and fill would be balanced onsite between islands, levee embankments, and the excavated channel. No excavation other than the channel and breaches would be necessary. Because the primary differences between alternatives 3 and 4 are that less material would be moved from the interior of Prospect Island, not all surfaces exposed to water would be protected with biotechnical plantings. Also, both breaches would be 300 feet wide. Project construction would take place over 2 years to allow soils to consolidate and to minimize any potential for landside slope slumps at or near the Prospect Island levees.

#### Levee Breaching

- Breach the Miner Slough and ship channel levees. Stabilize breaches with rock revetment.

#### Bridge

- Construct a steel bridge to span the Miner Slough breach.



### Levee Modifications

- Create a 10:1 slope from elevation zero to 5.5 feet msl with 10-foot berm at 4.0 feet msl or a 5:1 slope from elevation zero to 5.5 with a 40-foot berm at 4.0 feet msl on parts of the ship channel levee and the Miner Slough and both cross levees. The additional levee embankment will provide additional habitat area for SRA.
- Use plantings to protect levees from erosion.
- Add plantings on the berm along Miner Slough to provide additional wind protection to Ryer Island.
- Improve the Miner Slough levee road so that access is maintained for the Stringer property on the island.

### Islands

- Create a 5:1 slope with either a 40-foot-wide or 20-foot-wide bench at 3 feet msl on all islands. The island crown will be at 7.0 feet msl. The interior islands will provide additional habitat area for SRA.
- Hydroseed all areas that are higher than 3.0 feet msl.
- Use biotechnical plantings on all islands.
- Develop one island near the ship channel breach to dissipate wave energy generated by ships passing through the ship channel.
- Protect the portion of the islands near the breach along the ship channel levee from wave-generated erosion.
- All fill material is available on Reclamation's property.

### Channels

- Excavate a 5-feet-deep by 60-100-feet-wide central channel and a 5-feet-deep by 60-feet wide dead-end slough.
- Design this alternative to allow for dynamic processes of a freshwater tidal marsh system.

## **Alternative 5**

Alternative 5 (Plate 5) is very similar to alternative 4 except that the breach on Miner Slough is on the southern portion of the study area, south of the 9-acre, privately owned property. This breach was considered because a breach naturally formed during high flows in January 1997. This southern area has breached before and was identified as an area that may be a weak point.<sup>21</sup> The 5-feet-deep central channel connects the ship channel breach with the breach on Miner Slough. This alternative does not require a bridge. A 3-year establishment period would follow construction of alternative 5.

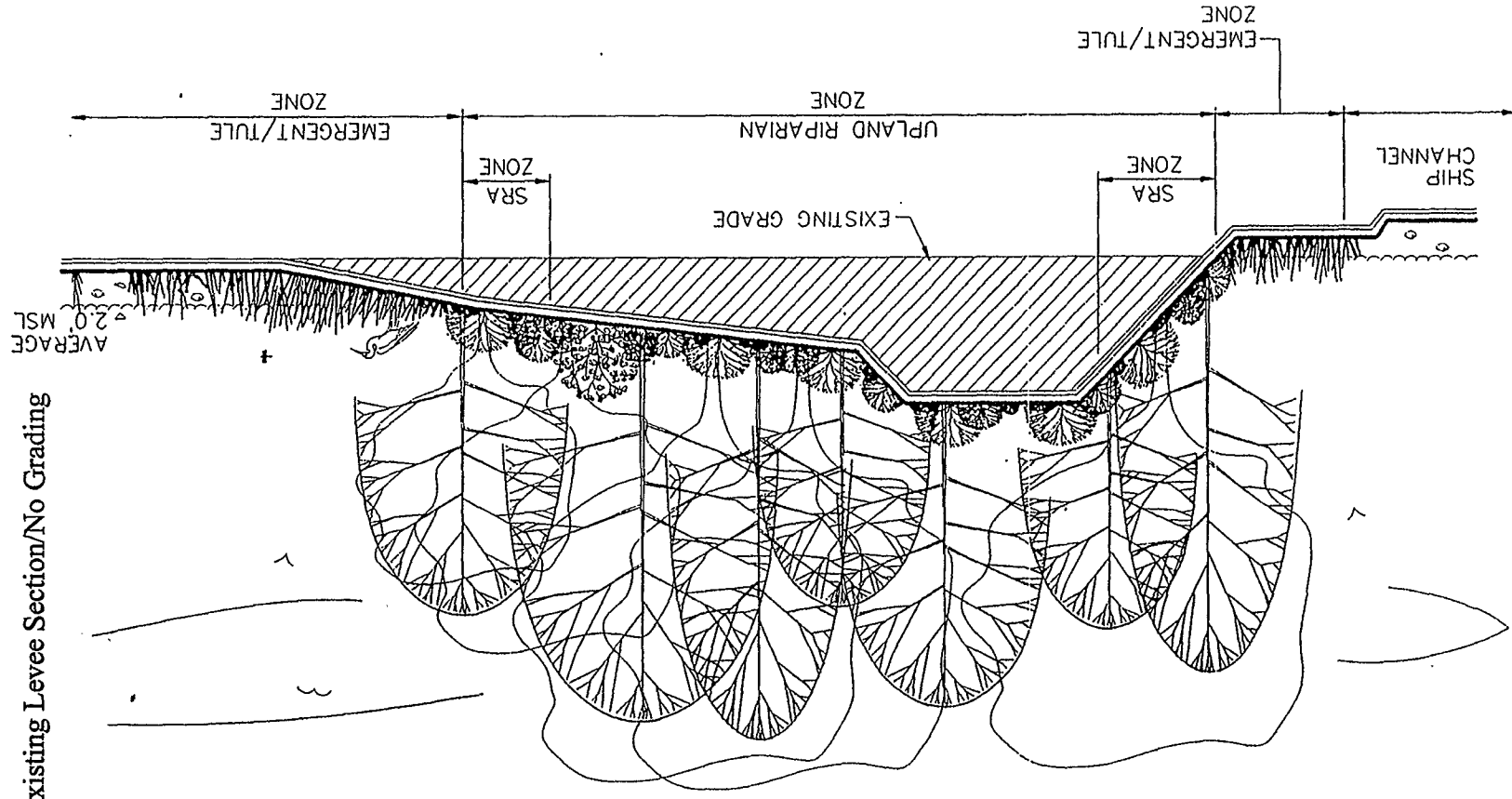
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<sup>21</sup> Personal Communication, Will Keck, Reclamation, October 1997.

During the establishment period, the planting contractor would be required to monitor the survival of planted vegetation and replace dead plant material so that the plant survival rate at the end of the establishment period is 70 percent.



Figure 4. Existing Levee Section/No Grading

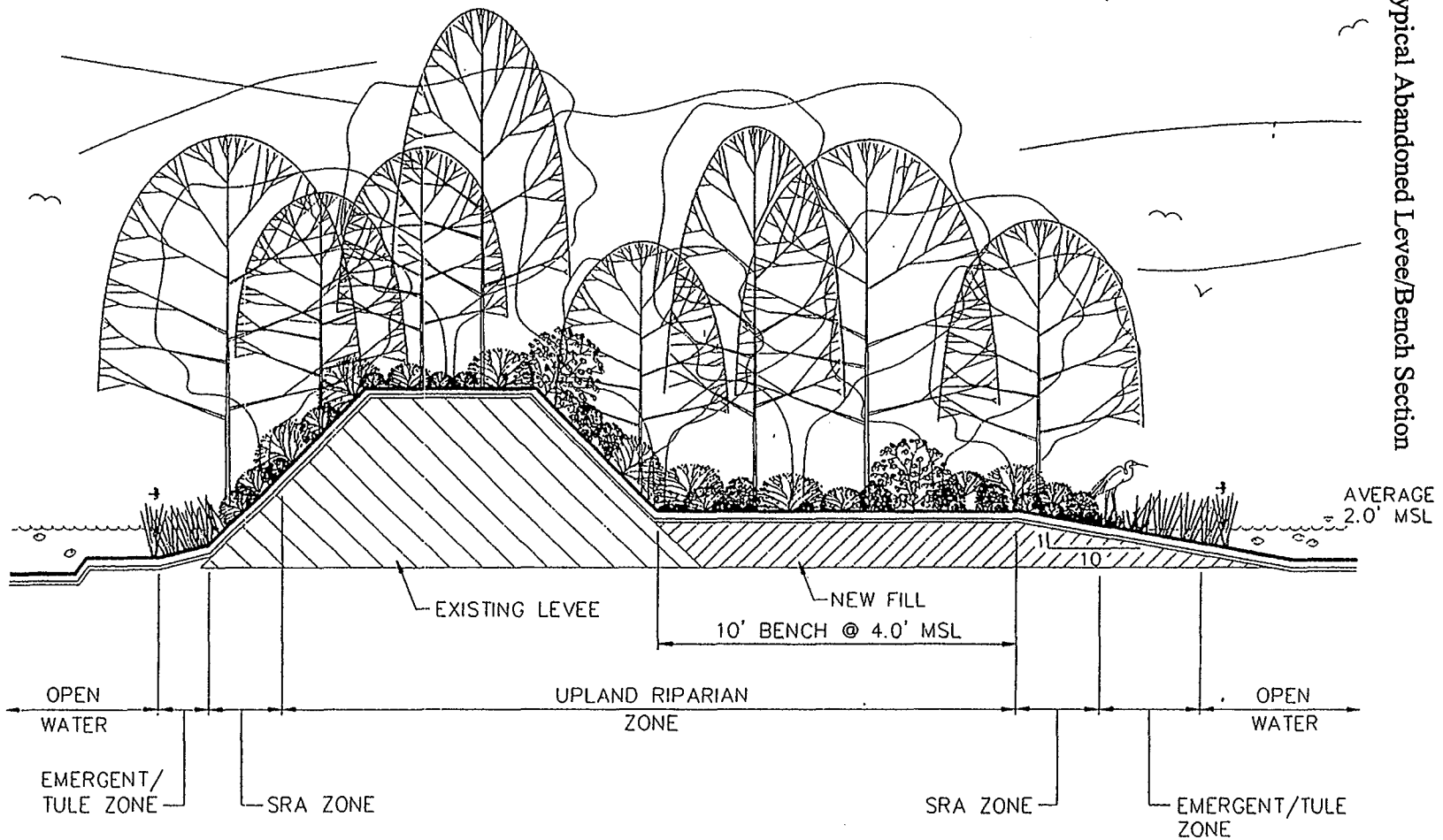


EXISTING LEEVE SECTION / NO GRADING

NOT TO SCALE



Figure 5. Typical Abandoned Levee/Bench Section

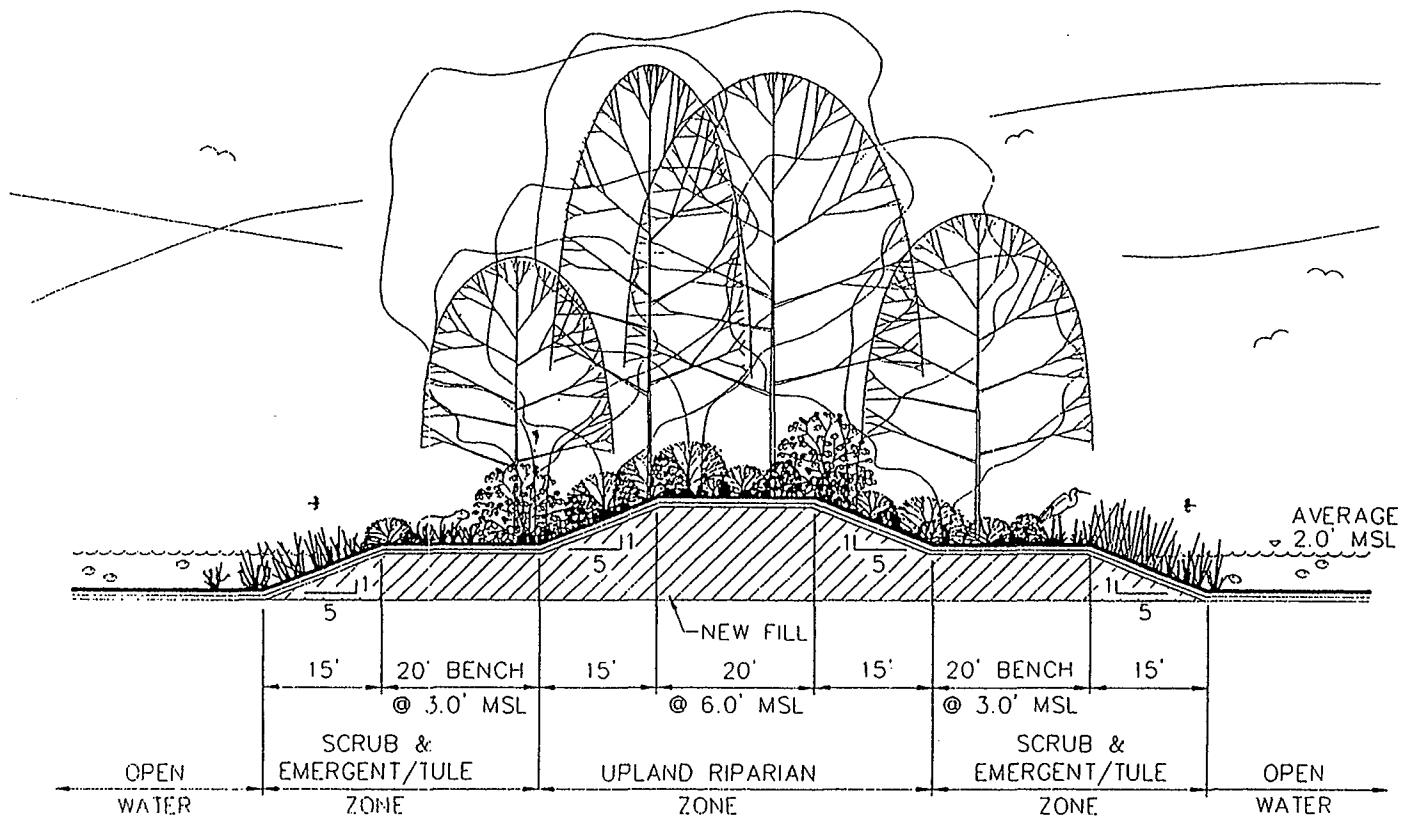


## TYPICAL ABANDONED LEVEE/BENCH SECTION

NOT TO SCALE



Figure 6. Typical Island Section



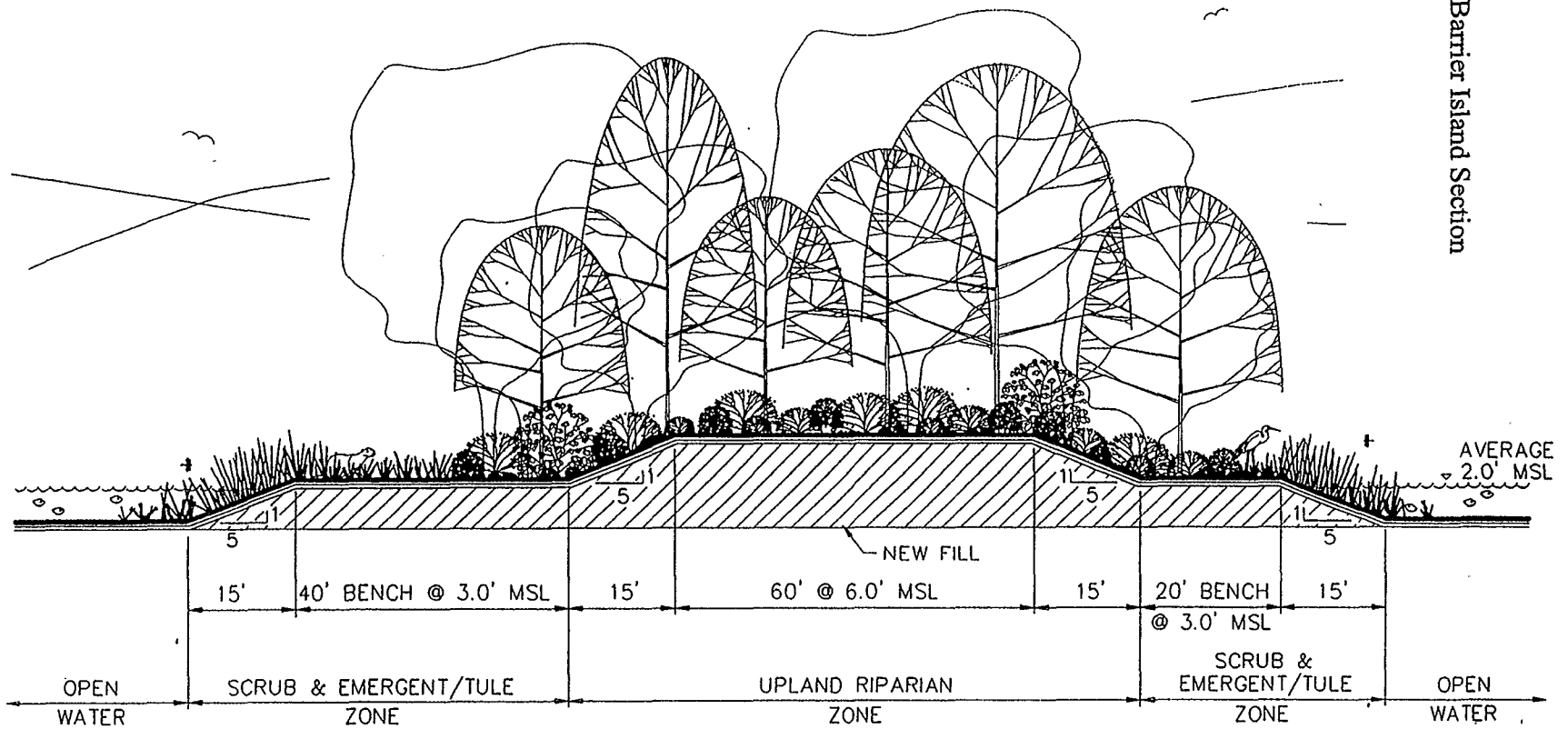
## TYPICAL ISLAND SECTION

NOT TO SCALE





Figure 7. Barrier Island Section



## BARRIER ISLAND SECTION

NOT TO SCALE



## CHAPTER 6

### COMPARING THE ALTERNATIVE PLANS

The islands and berms for the alternatives would be constructed to facilitate development of requisite cover types that may be beneficial for waterfowl, shorebirds, Delta smelt, Sacramento splittail, winter-run chinook salmon, and other species typical of historic Delta wetlands. The creation of these cover types may be beneficial for the life requisites of the target fish species of Delta smelt, Sacramento splittail, and winter-run chinook salmon. The shoal areas created by riparian and tule marsh may provide beneficial rearing grounds for Delta smelt. The Cache Slough mitigation area, which is located less than 1½ miles away, provides habitat for numerous smelt.<sup>22</sup> Moyle determined that smelt school in large numbers in the open waters of the Delta and disperse into channel and dead-end sloughs, most likely for spawning.<sup>23</sup> Although little is known about the spawning habits of smelt, the limiting factor of smelt populations is probably the lack of rearing areas.<sup>24</sup> The restoration of Prospect Island would provide habitat that may be beneficial for smelt spawning and rearing.

All salmon would greatly benefit from restored riparian habitat. The additional levee embankment and constructed interior islands of alternatives 3, 4, and 5 would provide about 45,000 lineal feet of SRA. Furthermore, salmon prefer water that is 5 to 8 feet deep, which provides suitable habitat without encouraging habitation by predators. The channel as described in alternative 3,4,5 is at elevation -5 feet msl and provides this specific type of habitat.

The requirements of splittail are similar to smelt. Splittail appear to spawn over flooded streambank vegetation or beds of aquatic plants. Their food consists of bottom invertebrates such as amphipods, aquatic insect larvae, clams, and earthworms. Tule marsh, mudflat, and riparian habitats created by alternatives 1, 2, 3, 4, and 5 would provide spawning areas and invertebrates for feeding.

The proposed channel through the center of the site for alternatives 3, 4, and 5 connecting the two breaches directs a constant flow of water through the site and provides deeper water, which salmon prefer. The channel design would discourage predator fishes and also help to restore full tidal action to the study area.

Alternative 1 lacked the habitat diversity provided by the other alternatives and was more costly (\$10.8 million total cost) to construct than alternatives 4 and 5. Furthermore, the shape and placement of the islands would allow long fetch lengths of up to 1½ miles. Long fetch lengths have the

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<sup>22</sup> Personal Communication, Mike Fris, U.S. Fish and Wildlife Service, November 1994.

<sup>23</sup> Peter Moyle, *Inland Fishes of California*, 1976, University of California Press, Berkeley, CA.

<sup>24</sup> Personal Communication, Steve Schoenberg, U.S. Fish and Wildlife Service, November 1994.

potential to create wind-induced waves that cause erosion. Alternative 2 provided high habitat diversity, but was very expensive (\$138 million total cost). Furthermore, alternative 2 was designed to remain static at hydrologic equilibrium. Channel formation and sedimentation would have to be modeled to create the stable wetland-riparian complex described for alternative 2 and to ensure that project features would remain static. The design would not allow for the dynamic processes of a wetland-riparian complex. Also, alternative 2 costs 13 times more than alternative 1 and over 40 times more than alternative 5. Therefore, alternatives 1 and 2 were eliminated during preliminary studies due to high costs, limited habitat output, and lack of local support.

The benefits which can be realized by constructing the project are fish and wildlife habitat restoration and incidental benefits in reduced O&M costs and improved recreation opportunities and water quality. The following sections discuss (1) direct costs and benefits of the alternatives and (2) incidental benefits common to alternatives 3, 4, and 5.

### **Habitat Restoration**

Restoration of Prospect Island would substantially increase the total acreage of several cover types that are valuable to fish and wildlife, especially Federally listed species. In alternative 5, the designed mix of open water, mudflat, and tidal marsh would provide habitat that may be beneficial for Delta smelt habitat. Flooded riparian islands could be beneficial as spawning habitat for splittail during most water years. The island could provide habitat that may be beneficial for rearing anadromous fish.

The Service conducted a Habitat Evaluation Procedure analysis to determine the net gains in cover types and annualized habitat units (AAHU) of restored habitat for alternatives 3, 4, and 5. The results of the habitat analysis are summarized in Table 3. Table 4 shows a cost comparison for alternatives 3, 4, and 5. Table 5 shows the first cost, average annual cost, first cost per AAHU, and average annual cost per AAHU for the three alternatives. Average annual cost includes first cost, interest during construction, investment costs, capital recovery costs, and annual O&M cost for the project, assuming a 2-year construction schedule and a 50-year period of analysis. As noted in Table 5 and in the Incremental Cost Analysis (Appendix E), Alternative 5 is the most cost effective plan with a cost of \$641 per habitat unit.

Table 3. Net gains/losses of cover type and habitat value for alternatives 3, 4, and 5

Cover Type	AAHU's** Alternative 3	AAHU's Alternative 4	AAHU's Alternative 5
Riparian	97.3	30	30
SRA	18.7	0	0
SPA*	0	10.5	10.5
Tidal Open Water	270.6	368	368
Tidal Emergent Marsh	282.4	173.6	173.6
Mudflat	220.4	194.5	194.5
Agriculture	-50.8	-44.7	-44.7
Upland	10.3	-8.3	-8.3
Shallow Flood Cover	-18.7	-30.1	-30.1
Non-tidal Emergent Marsh	-8.6	-0.2	-0.2
Non-tidal Open Water	0	0	0
Total Net Increases	899.7	776.6	776.6
Total Net Decreases	78.1	83.3	83.3
Bare Ground	0	0	0
Total Net Gain	821.6	693.3	693.3

\*SPA = shaded palustrine aquatic. The Service's Coordination Act Report considered SPA as a separate habitat type. However, this ERR combines SRA and SPA as one habitat type.

\*\*AAHU = Annualized Habitat Units

Table 4. Comparison of first costs for alternatives 3, 4, and 5

Item	Alternative 3	Alternative 4	Alternative 5
Fish and Wildlife Facilities	\$5,383,000	\$3,072,000	\$2,279,100
Cultural Resource Preservation	55,000	29,000	29,000
Lands and Damages	530,000	530,000	530,000
Construction Management	458,000	250,000	250,000
Design and Engineering	646,000	350,000	350,000
<b>Total</b>	<b>\$7,072,000</b>	<b>\$5,701,000</b>	<b>\$5,420,000</b>

Table 5. First and average annual costs for alternatives 3, 4, and 5

Alternative	Total First Cost	Average Annual Cost (for 50 years)	First Cost per AAHU*	Annual Cost per AAHU
3	\$7,072,100	\$634,400	\$8,608	\$772
4	\$5,701,000	\$456,080	\$8,223	\$658
5	\$5,420,000	\$444,440	\$7,818	\$641

\* Annualized Habitat Units

Although the project's final total first costs are not reflected in these tables, the evaluation presented in these tables are still effective in ranking the alternatives. Since the changes in cost did not occur with the annualized habitat units, Alternative 5 remains the selected plan. The added costs were found in real estate and planning, causing an increase in the total first cost for the selected plan, Alternative 5, from \$5.4 million to \$6.0 million. This cost increase would also be applied to the other alternatives. The increases in cost are fixed and the habitat units are not affected by the change, nor the ranking of the alternatives' cost-effectiveness. As a result, the evaluation selection process determining the best output alternative is still legitimate without needing to update the numbers.

## MEETING RESTORATION OBJECTIVES

The shallow tidal open water, mudflat, tule marsh, and riparian/upland cover types created in alternatives 3, 4, and 5 would meet the study objectives of providing and improving habitat that may be beneficial for Delta smelt, Sacramento splittail, anadromous fish, waterfowl, shorebirds, and other Delta wildlife species. Alternatives 3, 4, and 5 would also stabilize the interior of the ship channel levee,

reduce or eliminate Corps maintenance of the levee, and stabilize the Miner Slough levee against wave wash and other types of erosion.

Alternative 3 provides 128 more AAHU's than alternative 5 for an increase of \$1,652,000 for first cost and \$189,960 average annual cost. The first cost per AAHU for alternative 3 is \$790 more than for alternative 5. Therefore, the best value for habitat units is created by alternative 5.

## POTENTIAL ADVERSE EFFECTS

Alternatives 4 and 5 were selected for further evaluation, primarily because they met the study objectives for the least cost. Appendix K, the Environmental Assessment/Initial Study, provides additional discussion of potential adverse effects. Some of these effects are summarized below.

### Environmental

The adverse effects of the alternatives would be very similar. Flooding the reclaimed Delta islands would incrementally reduce the amount of freshwater outflow and increase the amount of saltwater inflow into the Delta. The modest degree of subsidence (much of Prospect Island is above sea level) and small area of Prospect Island minimizes or eliminates this potential effect of the proposed project and the effect is considered to be insignificant.

The valuable habitat complex that would be restored by implementing this project would be created at the expense of agricultural land. Agricultural land partially functions as a seasonal wetland, benefiting migratory bird species. The loss of this seasonal wetland cover type would not be replaced in-kind because tidal systems tend to favor different wildlife species. However, the tidal marsh does replace some of these seasonal wetland values, as well as provide additional benefits to a much wider array of aquatic and terrestrial species. Furthermore, the restoration would accrue significant benefits for aquatic species. Because of the scarcity of tidal freshwater marsh and the additional values to aquatic organisms, the proposed project restoration would not require mitigation to replace shallow flood cover. The Service's Coordination Act Report recommended no mitigation for this project.

Special Status Species. Although breaching Prospect island levees in two places may have a few minor effects on habitat for listed fish species, the proposed construction would not adversely affect any Federally or State listed or proposed species or critical habitats in the project area. In fact, the project would benefit delta smelt, Sacramento splittail, Central Valley steelhead, and chinook salmon species.

However, some conditions that may be harmful to these listed species could develop within portions of the restored habitat. As a result, a monitoring program has been established to detect any



problems. During monitoring, listed species will be taken, which will require that the Corps and DWR obtain an incidental take permit. If the monitoring shows that listed species are being exposed to environmental hazards from the project, corrective actions will be identified, and the steps necessary to obtain funding will be taken. The Corps will enter into Section 7 consultation with both NMFS and the Service to obtain incidental take permits for monitoring and to address the plan of action if conditions develop that are harmful to listed species. DWR will obtain take permits for State listed endangered species.

Water Quality. A potential water quality effect from the project could be an increase in dissolved organic carbon concentrations, which might increase the cost of treating drinking water for North Bay Aqueduct water users. As part of the proposed monitoring plan, the Interagency Ecological Program Prospect Island Project Work Team plans to monitor dissolved organic carbon concentrations in water discharged from Prospect Island.

### **Cultural**

Additional cultural resource work would be required. Cultural resource surveys have not yet been completed because Prospect Island has been in a flooded state. An intensive, on-the-ground survey of the study area would be required prior to the onset of construction. If cultural resources are found during the survey, they would be evaluated for the National Register of Historic Places. If sites are eligible for the Register, a determination of effect would be made in consultation with the State Historic Preservation Officer.

### **Operational**

Ship Channel Sedimentation. The project alternatives include breaches in the ship channel and Miner Slough levees. As the tide rises and falls, water would flow into and out of Prospect Island. Sediment bars could form on either side of these breaches. A sediment bar on the ship channel breach could potentially affect ship navigation and increase the frequency of maintenance dredging. Since the ship channel does not transport much sediment, however, this problem is unlikely. The ship channel breach has been made wide enough to preclude or minimize this possible effect. The results of the hydrodynamic modeling (Appendix G) indicate very low velocities within Prospect Island for both tidal simulation and flood simulation. Due to the low velocities and the minimal distances for which these velocities exist, the potential for sedimentation will be negligible. Furthermore, construction practices such as adding embankment material to levees, using compaction, and using biotechnical slope stabilization would be used to minimize erosion within the island. The embankment on the west side levee bank along Prospect Island ship channel levee is reinforced with rock revetment, further stabilizing the slopes from surficial erosion and preventing the levees from eroding into the channel. There should not be a major increase in capacity for holding dredge material due to the levee's existing bank protection already in place. Since the hydraulic models for alternatives 4 and 5 show that velocities

within Prospect Island would be about 0.4 foot per second (Appendix G), any sediment load would likely settle within the project boundaries of Prospect Island. The ship channel levee will no longer be maintained. The southern third of the levee experiences erosion. The ship channel may experience minor shoaling from the gradual erosion of this portion of the levee over time. Any material that does erode is expected to remain on the in-channel bench at about zero to -3 feet msl between the ship channel levee and the ship channel and is not expected to erode into the ship channel. Maintenance dredging of the ship channel would continue to be the Corps' responsibility and would not be the responsibility of the non-Federal sponsor for this project. Disposal areas would be designated by the Port. They would provide the sites within a few miles radius of Prospect Island upstream or downstream.

Hydraulic Effects on Passing Ships. The proposed breach in the ship channel levee may direct flows during normal tide cycles and floodflow conditions from the interior of Prospect Island outward to the ship channel, possibly affecting the navigability of the channel. However, hydraulic models of alternatives 4 and 5 show that construction of these alternatives would have little effect on the operations of the ship channel and surrounding land areas. Although maximum velocities through the ship channel breach could be as high as 6 feet per second, velocities in the ship channel itself would be less than 0.4 foot per second and are not likely to have a significant effect on passing ships.

Water Supply. The North Bay Aqueduct delivers water to Solano County and Napa County. Originally, water contractors who receive this water were concerned about the potential effect on the Barker Slough pumping plant (which serves the North Bay Aqueduct) from an increase in the Delta smelt population resulting from Prospect Island restoration. Currently, the DWR is required to discontinue or reduce pumping whenever concentrations of smelt larvae exceed a certain threshold. Furthermore, DWR, Solano County Water Agency, Service, Reclamation, and Corps met to discuss the water contractors' concerns. As a result, the Service's field supervisor for Sacramento sent the following memo to Reclamation. This memo reduced the water contractors' concerns. Pumping may not be adversely affected by the project.

Increased Delta smelt larval may occur as a result of increases in shallow-water habitat associated with Prospect Island. These increases may cause additional restrictions on pumping at the Barker Slough diversion with the requirements in March 6, 1995, biological opinion. It is the Service's intent that increased larval production associated with Prospect Island not cause additional pumping restrictions when risk to the overall population of Delta smelt is low. In the 1994 draft Recovery Plan, wide distribution and high numbers of rearing juveniles have been shown to lower risk to Delta smelt. If these conditions exist, no additional Barker Slough pumping restrictions will occur due to increased larval production from Prospect Island.<sup>25</sup>

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<sup>25</sup> Service, "Biological Opinion Concerning the Operation of the Central Valley Project and State Water Project: Effect on Delta Smelt," unpublished report, 1995.

Furthermore, farmers on Ryer Island expressed a similar concern that additional restrictions may be placed on their diversions for irrigation. The Corps contacted the Endangered Species Office of the Service about the Delta smelt. The Service informed the Corps that no new or additional restrictions would be placed on Ryer Island as a result of Prospect Island restoration.<sup>26</sup> Ryer Island would not be singled out for diversion restrictions.

Agriculture. Adjacent farmers were also concerned that certain agricultural activities, such as chemical spraying and irrigation runoff, could be prohibited or curtailed as a result of restoring habitat at Prospect Island. The Corps contacted the proposed refuge manager concerning possible restrictions on adjoining farmland. No additional restrictions are planned on the use of farm equipment or chemicals by surrounding landowners.<sup>27</sup>

Severance. The Port currently has legal road access across Prospect Island via the ship channel levee. This access will be severed when the breach through the ship channel levee is excavated. Severance damages have been estimated by the Real Estate Division in Appendix D and are included as a project cost.

Erosion of Project Levee. The east levee of Miner Slough on Ryer Island (also the east levee of the Yolo Bypass) is part of the flood control project. Results of sonar studies conducted by Reclamation showed no erosion damage to the Ryer Island levee 6 months after the Prospect Island levee break in January 1997. This lack of erosion indicates that no increased erosion of the project levee would result from Prospect Island restoration. Furthermore, hydraulic models of alternatives 4 and 5 show that the lateral flow into Miner Slough dissipates significantly before reaching the east levee. Water velocities decrease from 7 to 0 feet per second through the breach to 1 to 0 feet per second at the east levee. There would be minimal effect on the east Miner Slough levee due to the condition of the existing riprap on the Ryer Island levee and quality of the levee.

Seepage. Ryer Island farmers claim that every time that Prospect Island has been flooded, Ryer Island experiences seepage. Based on hydrologic data collected by DWR since March 1996, Reclamation has concluded that there is no significant effect to Ryer Island from flooding on Prospect Island and that seepage on Ryer Island appears to originate from Miner Slough.

The Corps' in-house hydrologic review as stated in the "Prospect and Ryer Island Hydrologic Analysis" (Appendix H) found a relationship between the stage in Miner Slough and seepage on Ryer Island, but found no apparent relationship between flooding on Prospect Island and seepage on Ryer Island. The conclusions that were drawn from this report indicate that the groundwater elevations on Ryer Island may be governed by the water-surface elevations in Miner Slough.

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<sup>26</sup> Personal communication, Mike Thabault, Service, March 1998.

<sup>27</sup> Personal Communication, Tom Harvey, Service, March 1998.

Prior to the beginning of Prospect Island data on May 2, 1996, charts revealed that the ground water elevations at the Ryer Island wells followed the general trend of the Miner Slough stages. During the period of May 2<sup>nd</sup> to May 10<sup>th</sup> of 1996, the Prospect Island elevations were rising while the Ryer elevations showed a general downward trend. During the period of increased stage in Miner Slough in May of that year, groundwater observations, for both Prospect and Ryer Islands, showed an upward trend. As the stage in Miner Slough decreased, the groundwater elevations in both Ryer and Prospect Islands decreased.

In addition, the report by Todd Engineers, "Preliminary Seepage Analysis on Prospect Island" dated May 1998 (Appendix I) was requested by the Department of Justice to evaluate potential hydrologic impacts of flooding on Prospect Island. The Todd Engineers analyzed data acquired during the dewatering operations on Prospect Island during the fall of 1998 compared the well data on Ryer Island and Prospect Island to Miner Slough water table levels and precipitation levels. The report states it is likely that the water table beneath the islands is hydraulically connected to the surface water levels in Miner Slough. Wells closer to Miner Slough are first to respond to stage changes in Miner Slough and demonstrate the largest fluctuations in water levels. Wells farther away also respond to stage changes in Miner Slough, although the lag time is longer and the fluctuations are smaller.

The report states that in general, seepage rates are governed by the difference in elevation between the surface water stage and the water table. Therefore, the controlling factor for seepage through the Miner Slough/Ryer Island levee is the stage in Miner Slough. Wet conditions on Ryer Island were likely the result of high rainfall on the island and high stages in Miner Slough from increased precipitation. Upstream dam releases and tidal fluctuations also could have contributed. The conditions could have resulted either from Miner Slough seepage (rising groundwater from below) and/or ponding of rainwater that could not be drained.

The report further states that increased seepage is unlikely to impact water levels beneath Ryer Island. The flooding and circulation of flood waters over Prospect Island will not increase the stage in Miner Slough and should not have any adverse impact on the Miner Slough/Ryer Island levee. In fact, the project may result in slightly decreased flows in Miner Slough, which may decrease seepage.

The suggested "hydrologic pressure" on the Ryer Island levee does not appear to be valid. Instead, the seepage through the Miner Slough/Ryer Island levee is controlled by the stage in Miner Slough and is not related to the flooding of Prospect Island. The conclusion presented in the report states that the elevation of the water table beneath Prospect Island and Ryer Island in the vicinity of Miner Slough is controlled predominantly by the stage in Miner Slough.

The Corps' also considered the DWR's Geology and Groundwater Section data collection and analysis found in their report, "Shallow Groundwater Level Trends in the Northwest Portion of Ryer Island, Sacramento-San-Joaquin Delta" (Appendix J). The report discusses the data in the hydrologic

analysis of Ryer Island groundwater level changes. The report covers groundwater levels measured on Ryer and Prospect Islands, the level of water on Prospect Island during the 1996 and 1998 pumpouts, water levels in Miner Slough, and precipitation records from three nearby stations. This section also includes a short discussion on the elevations used for well and surface water data.

The report's conclusions reveal that the water level elevations in Ryer Island wells, measured on a weekly basis, show a predictable seasonal trend. In general, the water levels rise from late summer into the winter, and drop from late winter into the summer. This pattern is typical of groundwater levels elsewhere in the Central Valley. During the winter months, water level rises of one foot over a one-week period are occasionally seen in individual wells. These increases appear to coincide with precipitation, as measured at the Ryer Island gage.

The conclusions found in the reports discussed above are consistent. The analysis of the hydraulic conditions and the well data from collected April 1996 to the present on Ryer Island and Prospect Island reveal that there is no direct hydraulic connection. Based on their review, Corps engineers determined that ground-water elevations on Ryer Island may be governed by the water-surface elevations in Miner Slough. There is no clear evidence that there is a link between Prospect Island flooding and seepage on Ryer Island.

## CHAPTER 7 THE SELECTED PLAN

### DESCRIPTION OF SELECTED PLAN

Alternative 5 is the selected plan. The selected plan would create a dynamic freshwater tidal marsh system that would (1) provide habitat that may be beneficial for anadromous fish, species listed under the Federally Endangered Species Act, such as the Delta smelt, Sacramento splittail (proposed for listing), and waterfowl and shorebirds on the Pacific Flyway and (2) provide high quality riparian, shaded riverine aquatic, wetland mudflat, emergent marsh, upland and shallow water habitat for a wide variety of aquatic, avian, and terrestrial species. The design of Prospect Island allows for the natural processes of a tidal freshwater system to function and would require little maintenance. The selected plan accomplishes all project objectives. It is also the least costly alternative and provides benefits similar to more costly alternatives.

The estimated habitat acreage from existing project conditions and planned earthwork are shown in Table 6 along with their corresponding elevations. These numbers are estimates and will vary as field and project conditions change. Some habitat numbers vary from Fish and Wildlife Service numbers due to different initial assumptions such as mudflat formations. Subsequent field observations are being reviewed for estimated habitat areas.

Predicted habitat acreage have been calculated (See Table 6) with revegetation anticipated on abandoned levee slopes, benches, and islands and their respective water interface areas. Open water areas will be dynamic with volunteer emergent vegetation breaking up any large expanses of open water (from field observations). Natural revegetation has already occurred within the project's areas and is predicted to readily occur when the project is implemented. Surrounding lands will provide excellent seed source and volunteer recruitment. Mudflat creation is not anticipated to be significant within the site due to the tidal cycle elevations and from field observations of 1997.

Table 6. Estimated Habitat Acreage

Habitat Type	Elevation	Acres
Open Water	<-1.0' msl	594.5
Mudflat*	@ 0.0 msl	4.0
Tule / Emergent	0.0' to 3.0' msl	333.8
Tule/Emergent Potential	-0.5' to 0.0' msl	230.0
SRA / Riparian / Upland	>3.0' msl	150.6
Miscellaneous (roads)	NA	3.1
	<b>Total Acres:</b>	<b>1,316.0</b>

\*: Estimated zone of 20' wide along water interface

The selected plan provides many environmental benefits, and no significant adverse environmental effects have been identified from the plan. No mitigation has been recommended by either the Corps or regulatory agencies such as the Service.

The selected plan best meets the designated study objectives described for environmental, operational, and maintenance concerns and is substantially less costly than alternatives 1, 2, and 3. Although alternative 4 and the selected plan provide similar benefits and a similar hydraulic profile, the selected plan is less costly because it does not require a bridge. Furthermore, since the selected plan shows a breach in a location that tends to breach naturally during flooding (the Miner Slough breach), the selected plan is likely to provide a long-term O&M cost savings over alternative 4 because levee repairs might be needed periodically at this location if this site were not already breached. Based on the incremental analysis and designs, construction of the selected plan is the most cost-effective alternative, with an average annual cost per AAHU of \$641. Appendix C, the itemized cost estimate, shows a cost breakdown for the selected plan.

## PROJECT MODIFICATION COSTS

An MCACES level cost estimate was prepared. The estimated total project modification cost for the Prospect Island project is approximated at \$6.0 million based on October 1997 price levels. The Federal portion of the project cost is estimated to be \$4.5 million and the non-Federal portion is \$1.5 million. The apportionment of costs are shown on Table 7.

Table 7. Total Project Cost

Description:	Total:
Real Estate	\$820,000
Site Work	\$2,475,000
Revegetation	\$1,415,000
Cultural Resources Preservation	\$45,000
Planning, Engineering and Design	\$925,000
Construction Management	\$320,000
<b>Total Project Cost</b>	<b>\$6,000,000</b>

Following construction, the non-Federal sponsor will be responsible for 100 percent of the costs of operation, maintenance, repair, rehabilitation, and replacement associated with the modifications. These annual costs are estimated to be \$69,000.

## OPERATION AND MAINTENANCE

As non-Federal sponsor, the DWR would be required to assume all O&M responsibilities for the completed Prospect Island project. However, Prospect Island is intended to be included in a new national wildlife refuge that would also include Little Holland Tract and Liberty Island. After the project is completed, Reclamation would transfer ownership of the land to the Service, who plans to operate and manage the project (as part of the refuge) on behalf of the DWR.

O&M activities for the proposed project would include maintenance, as necessary, of the Miner Slough levee and the cross levees separating the study area from the Port's property to the south. The north levee, separating Prospect Island from remnants of Little Holland Tract, would be maintained fully. Initially, maintenance of these levees is estimated to cost about \$20,000 annually in normal years. Ultimately, as the vegetation at this site matures, soil erosion is expected to decline and the cost of levee maintenance should decrease. The cross levee is at the established 10:1 slope, 30-foot berm with existing plantings and further stabilized with rock revetment, erosion and degradation of the levee should be minimal. Furthermore, the three year establishment period would guarantee vegetative growth and would secure island features.



The selected Alternative 5 is the preferred plan. Total annual O&M costs for the selected plan are estimated at \$69,000. Approximately \$30,000 of these costs would be applied towards the salaries for staff responsible for refuge management. Approximately \$20,000 would be used for levee maintenance. Approximately \$10,000 would be used to acquire equipment, supplies and services to implement maintenance, weed control, and biological monitoring. Approximately \$9,000 is factored into the cost estimate as a contingency for uncertainties in the cost of operation and maintenance. A \$1.25 million endowment fund will be established for the long-term operation and maintenance of the project. Costs for performing major levee repairs could be partially covered by interest from the endowment fund accrued over several years. Funds for additional maintenance costs of the project would be sought by the Service, in cooperation with DWR.

### **Monitoring Programs**

Monitoring as part of the Section 1135 project will be limited to the planted vegetation. During a 3-year period following planting, the construction contractor under the oversight of Corps, will monitor the site and replace plant materials as necessary to assure that the planted vegetation, a critical component of the restoration project, is well established.

A separate monitoring program, much more comprehensive than could be undertaken as part of a Section 1135 project, will be funded by CALFED and overseen by the California Department of Water Resources with cooperation of other agencies. This program is necessary because adaptive management is essential to the CALFED Bay-Delta Program and there is need to constantly monitor the system and adapt the actions that are taken to restore ecological health and improve water management. This additional monitoring program will cover fisheries, wildlife, vegetation, water quality, zooplankton, phytoplankton, disinfection byproduct precursors, benthos, and bathymetry (Appendix K, Attachment C). The monitoring, scheduled to last for 3 years following construction, will determine which features of the restoration site are functioning as wetland, SRA, riparian, and upland habitat, and are providing effective habitat for fish and wildlife. The restoration progress of Prospect Island will be compared to the progress of Delta freshwater tidal wetlands such as Donlon Island, Venice Cut Island, and Cache Slough/Yolo Bypass and could also be used to provide information for other tidal wetland projects.

## REAL ESTATE REQUIREMENTS

The total project area encompasses 1,316 acres of wetland habitat. Table 8 describes the division of property within Prospect Island. A greater portion, 1,228 acres of that is owned by the Reclamation. The Reclamation will provide these lands at no cost to the project. The non-Federal sponsor (DWR) will obtain a joint use permit from the Reclamation to secure the lands needed for the project (1,228 acres). The Corps will facilitate joint use permit negotiations between the Bureau of Reclamation and Department of Water Resources to ensure that there will be no impediment to the construction, operation, or maintenance of the project due to land ownership.

The Port of Sacramento owns 88 acres of levee road stretched along the west side of Prospect Island. This remaining acreage completes the total restoration project area of 1,316 acres. The project design includes a breach along the 88 acre levee road near the southern portion of the project area. The non-Federal sponsor is responsible for paying a damage fee for severing the Port's levee.

Table 8. Division of Property within Prospect Island

Property:	Location:	Owner:	Acquired for Project:	Acres to be Restored:	Real Estate Issues and Conditions:
1,228 acres	Northeast portion of the island	Reclamation	1,228 acres	1,228 acres	Lands provided to DWR at no cost to the project
88 acres	The west levee road along ship channel	The Port	88 acres	88 acres	Non-Federal sponsor will acquire right-of-way for a breach location as part of their project cost
309 acres	Southernmost portion of the island	The Port	none	none	Non-Federal sponsor will acquire a severance fee for breaching the ship channel levee
9 acres	Private parcel east along Miner Slough north of the cross levee adjacent to Reclamation property	Mr. Stringer	9 acres	none	Property will be purchased or serviced with power by relocating new lines across Miner Slough
22 acres	Private parcel east along Miner Slough south of the cross levee adjacent to Port property	Mr. Halls	none	none	No current road access exist and project will therefore cause no impact
<b>Total Acreage to be Restored:</b>				1,316 acres	Permanently inundated with improved restoration habitat

Defining the two properties is a cross levee separating the northern property owned by the Reclamation and the southern property owned by the Port. The southern portion, the 309 acres will remain as a disposal ground for dredge material from the Sacramento Deep Water Ship Channel. The Port's west levee road will be severed due to one of the project's proposed breach location. As a result, there would no longer be vehicular access to the southern portion of the island south of the cross levee. The dredge disposal would be performed by boat from along the water's edge.

The project would not impact the other private 22-acre parcel located south of the cross levee. The property currently has no existing road access. The project breach along Miner Slough would not require a severance fee for this property.

The non-Federal sponsor is responsible for resolving real estate issues with the two landowners, the Port's 88 acres and the 309 acres south of the cross levee, and Mr. Stringer's 9 acre private parcel. The land purchases and/or damage costs will be acquired prior to completing construction of the project.

### **Utility Relocations**

Existing powerline utilities will be removed from project site. They have fallen into disuse since the floods of 1997. Electrical is the only identified utility service and easements located within the Prospect Island site. PG&E electrical power crosses the Prospect Island from Ryer Island to provide service capabilities to Liberty Island, the Prospect Island Bureau of Reclamation pumps, and possibly the Stringer Property. Service for Liberty Island and the Reclamation pumps at Prospect Island have been discontinued. The existing poles and aerial lines will need to be removed and/or relocated before island flooding. No service relocation or reconnection for these areas is planned. The existing wood and steel aerial electrical poles are planned to be removed by PG&E. The possible re-use of the wood poles for perch or nest sites was considered, but was eventually dismissed due to their instability and unknown material composition.

One private parcel, the 9-acre owned by Mr. Stringer would require power. Electrical service for the property only needs to be restored if it is not purchased. The preferred option is to purchase the property. Maintenance for land access and utilities would no longer be necessary since private property along Miner Slough requires land and utility access through the project site. Relocation of utility lines would no longer be necessary. The cost to purchase the property is less than providing new easements and relocation costs. If the parcel is not purchased, the property will require their power lines rerouted along the Miner Slough levee, strung aerially across Miner Slough or by underground service from Ryer Island.

## NEED AND JUSTIFICATION FOR THE PROJECT

Corps projects adjacent to Prospect Island and upstream projects in the watershed have directly, indirectly, and cumulatively contributed to fish and wildlife habitat losses. Past Corps projects have allowed agriculture to develop in the Delta, which has contributed to the loss of important habitat. Implementation of Prospect Island habitat restoration provides a way for SRA, riparian, and freshwater tidal wetland habitat to be restored. Given the scarcity of tidal freshwater marsh in the Delta and the benefits that Prospect Island could provide for chinook salmon, delta smelt, Sacramento splittail, waterfowl, and shorebirds, and other terrestrial and aquatic wildlife in the Delta, the construction of restoration features at Prospect Island is justified. Furthermore, the restoration can be accomplished at the reasonable average annual cost of \$641 per AAHU and has a broad base of Federal, State, and local support.

Prospect Island is contiguous to the Corps ship channel and a flood control project levee along Miner Slough and is affected by numerous upstream dams that provide flood protection. Abandoning maintenance along the study area portion of the ship channel levee (about two-thirds the length of the levee) would allow the Corps to realize cost savings in expenses for Corps maintenance of the ship channel.

The plan would restore tidal wetland, riparian, SRA, upland, mudflat, and open water habitats at Prospect Island and relieve the Corps costs to maintain the ship channel levee along Reclamation's property. The results of the hydraulic model show that the with-project condition will not adversely affect the existing navigation project or flood protection level in the study area.

## INCIDENTAL BENEFITS

Recreation. Although not designed for such activities, the proposed project could provide opportunities for bird watching and other wildlife-dependent recreational activities. The conversion of farmland to wetland would expand the habitat of many important recreational and commercial fish species and provide opportunities for increased fishing in other areas of the Delta.

Water Quality. A healthy wetland system would have a beneficial effect on water quality. Wetlands improve water quality by retaining pollutants, delaying their movement as water circulates through the system. This delay allows pollutants to be used by plant processes and other biochemical processes and to be converted to less harmful substances. Pollutant detention further allows sediments to settle. Pollutants include toxic chemicals, disease-causing micro-organisms, pesticides, and fertilizers. The Service's Coordination Act Report (Appendix K, Attachment A) indicates that the high surface-to-volume ratio of the shallow wetlands would improve water quality by enhancing oxygen levels and providing for the absorption of excess nutrients by sediments and emergent plants.

The project would also result in a reduction of agricultural drainage water. The study area is usually farmed under conventional agricultural practices using chemical pesticides and fertilizers. Removing this land from agricultural production would eliminate the use of these chemicals on the study site.

The Central Valley Regional Water Quality Control Board was consulted for a more definitive analysis of the effect of the project on water quality. The Board found that the project would benefit the water quality in the area and would have no adverse effects. Furthermore, the project area has associated riparian water rights. Since Reclamation would no longer exercise those water rights, there would actually be a net increase in water supply and quality.

## COST SHARING REQUIREMENTS

In accordance with Section 1135(b) of the Water Resources Development Act of 1986, as amended, and implementing guidance, the costs of preparing the Ecosystem Restoration Report (ERR) are initially fully funded by the Federal government. Subsequent to project approval, plans and specifications would be fully funded by the Federal government. Once the project is approved, and a Project Cooperation Agreement (PCA) is signed, the ERR, plans and specification, and construction costs shall be included as part of the total project modification cost to be shared 75% Federal and 25% non-Federal. The Corps, representing the Federal Government, would be responsible for design and construction of the proposed modification.

Table 9. Cost Apportionment

	Cost (\$1,000s)
Total Project Modification Cost	\$6,000
Sub-total, Federal Cost	\$4,500
Non-Federal Cost	
LERRD's	\$770
Cash	\$730
Sub-total, non-Federal	\$1,500

As noted in the sponsor's Letter of Intent (Appendix A), the DWR has indicated its intent to provide assurances of local cooperation for the Prospect Island project. Before construction, the DWR will be required to furnish a written agreement that it will provide these assurances. These assurances include the following:

- Provide all lands, easements, rights-of-way, relocations, and disposal areas necessary to implement and maintain the project;

- Contribute a maximum of 25 percent of the project modification cost, with credit given for lands, easements, rights-of-way, relocations, and disposal areas;
- Comply with the provisions of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 USC 9601-9675).
- Hold and save the Department of the Army free from damages arising from implementation, operation, maintenance, repair, replacement and rehabilitation of the project modification, except for damages due to the fault of or negligence of the Department of the Army or its contractor; and
- Operate and maintain the project after being notified by Corps that implementation of the project is complete.

## **SUPPORT FROM OTHER AGENCIES**

Inter-agency interest in this project is very high. The DWR is the non-Federal sponsor for Prospect Island and has provided a letter of intent (Appendix A). Before construction, the DWR will be required to furnish written agreements that will provide assurances. A financial statement and the Project Cooperation Agreement (PCA) will address the state's capability to participate in the project. The project has support from Reclamation, the Service, the NMFS, the DFG, the Wildlife Conservation Board, the Port, Solano County Water Agency, the Trust for Public Lands, CALFED, and Category III.

Acquisition and restoration of Prospect Island are also consistent with the local implementation element of the North American Waterfowl Management Plan, which is the Central Valley Habitat Joint Venture's strategy to concentrate restoration efforts on the periphery of the Delta where subsidence and levee maintenance are less of a problem than in other parts of the Delta.

Coastal America, a consortium of agencies (including the Corps) that promotes the environmental values of coastal areas, has officially endorsed the Prospect Island Fish and Restoration Study and the selected plan.

## **CONSTRUCTION SEQUENCE AND SCHEDULE**

The selected plan would be constructed over a 2-year construction period, followed by a 3-year establishment period. Several geotechnical recommendations would also be incorporated during

construction. These include slope protection at breaks, incorporation of appropriate vegetation to minimize wind and wave damage, determination of a desirable elevation of the mounds so that estimated settlement can be incorporated into the design, location of mounds on the east side of the island to provide added protection to the Miner Slough and Ryer Island Slough levees, and restricting fill placement to no more than about 3 to 5 feet per year.

During the 3-year establishment period, the construction contractor, under the guidance of the Corps, would monitor the site and replace plant materials, as necessary. Maintenance items will include: weed control, irrigating riparian plantings, planting upkeep, and some minor re-planting efforts. Natural revegetation of native riparian volunteers will be targeted as a goal.

The goal for the revegetation and bio-engineering work after one year will be to initiate the stabilization and protection of the interior levee and island water interfaces from wind caused wave action, and establish 22 acres of riparian plantings. The success criteria is targeted to:

- 80% of the shorelines stabilized and/or protected
- Establishment of 60% of emergent and willow/cottonwood plantings
- Volunteer planting growth along shorelines and bench areas.
- 80% of the riparian plants established

The following, Table 10, is the anticipated construction schedule for the project for site work and revegetation. This schedule assumes that all soils explorations and design work will be completed by August 1999 and no special construction considerations are required. This schedule is subject to environmental restrictions and conditions. Missing any of the construction windows can cause a delay in project completion.

Table 10. Project Schedule

<b>Implement Subject:</b>	<b>Date:</b>
Approved ERR	July 1999
Initiate P&S Phase	July 1999
Initiate Soils Survey	July 1999
Sign PCA	September 1999
Complete P&S	September 1999
Advertise Construction Contract	September 1999
Award Construction Contract	October 1999

Complete Phase I Construction	November 1999
Begin Plant Maintenance Phase I	October 1999
Begin Phase II Construction	April 2000
Complete Phase II Construction	September 2000
Prepare O&M Manual	November 2000
Begin Plant Maintenance Phase II	November 2000
End of Plant Maintenance Phase II	November 2003

## FURTHER STUDIES

Further studies would be undertaken during the preparation of plans and specifications. Soils explorations and cultural surveys could not be conducted prior to the preparation of this ERR because Prospect Island was flooded in January 1997, and explorations and surveys could not be completed. Soil explorations will be conducted to assess the availability and quality of borrow materials as well as ensure that pervious sand deposits are not exposed during construction of the interior channel cut. The range and variability in the ground-water table will also be evaluated. Soils explorations would be undertaken during the plans and specifications phase and during the construction phase to ensure the availability and quality of borrow materials and that pervious sand deposits are not exposed during construction of the interior channel cut.

An archeological survey of the areas not previously surveyed has been held up due to the same reason the soils investigations were not performed. Once the interior of Prospect Island is dry, the cultural resources survey will proceed prior to construction. The records check and the fact that the land has been farmed for a long time suggest that there are no significant sites there.





## CHAPTER 8

### PUBLIC INVOLVEMENT AND COORDINATION

Public involvement and coordination for this project began in April 1994. Several scoping meetings and site tours were held throughout the study. A multi-disciplinary team in the Corps Sacramento District and other experts in various biological and engineering fields, including local interests, participated in the preparation of this ERR. Team members made site visits to verify site conditions, determine the need for habitat restoration, and formulate possible alternatives.

Early in the study, the Corps met with many separate interest groups including the Service, Reclamation, BLM, NMFS, DWR, DFG, Port, Category III, CALFED, Metropolitan Water District of Southern California, Solano County Water Agency, TPL, and private landowners. A multi-agency panel participated in the formulation of this study and met about once a month to discuss issues. Furthermore, consultations were held with other participants, including Ducks Unlimited, Wildlife Conservation Board, Department of Boating and Waterways, University of California at Davis, University of Washington, Aquatic Habitat Institute, and Coastal America.

This report was sent to numerous local, State, and Federal agencies, private interest groups, and individuals for review and comment. Comments received during the public review period were considered in preparing the final report and were considered by reviewers and decision-makers during subsequent report processing. Comments and recommendations also assisted the Corps and DWR in determining that a Finding of No Significant Impact (FONSI) and Negative Declaration are appropriate.

Coordination with the local landowners began with a scoping meeting on April 7, 1997, to discuss the concerns of farmers on Ryer Island. Further coordination continued between the Corps and DWR and the farmers on Ryer Island February 19, 1998 and June 29, 1998. The fourth meeting was held on September 30, 1998 to discuss the draft Corps responses to the Ryer Island issues to ensure concerns were adequately covered as stated in their November 25, March 3, and March 31, 1998 letters.



## CHAPTER 9 CONCLUSIONS

The environmental resources within the Delta have been declining for over the past hundred years. Contributing to this decline through significant changes to the ecosystem have included construction and operation of the ship channel; development of the flood control project, including the extensive system of levees, channels, and bank protection; construction of upstream dams and water diversions; and continued agricultural expansion and urbanization. Agricultural and urban development have encroached severely into the natural flood plains and tidal freshwater tule marshes. Levees closely confined riverbanks, while constructed navigation channels encroached on natural wetlands. Natural banks and associated woody riparian vegetation have been converted to riprapped banks largely devoid of vegetation.

Section 1135(b) of WRDA 1986 gives the Secretary of the Army the authority to modify Corps projects to improve the environment. Modifications must be consistent with the Corps project purpose, and there must be support for and involvement by a non-Federal sponsor.

This ERR assessed the potential for Federal participation in restoring fish and wildlife habitat on Prospect Island. Prospect Island is bordered on the west by the ship channel and on the east by Miner Slough. (The east levee of the slough is a flood control project levee.) These projects and related developments have contributed to a decline in wetland and riparian habitat values. Today, only about 17,000 acres of wetlands remain of the original 700,000 acres in the Delta.

The ERR presents alternative plans to restore habitat for fish and wildlife, especially threatened and endangered species. These alternatives share the same restoration objectives of creating habitat that may be beneficial for Federally listed threatened delta smelt and threatened Sacramento splittail, chinook salmon, waterfowl, and shorebirds. Overcoming site specific constraints are stabilizing the ship channel levee to reduce or eliminate Corps maintenance responsibilities on a portion of that levee, and stabilizing the Miner Slough levee and cross levees on Prospect Island against wave wash and other types of erosion. The selected plan would achieve the study objectives of restoring fish and wildlife habitat by creating islands within Prospect Island, stabilizing the existing levees, and then breaching the existing levees to restore full tidal action to the site.

Originally, five preliminary alternatives were considered. Design features, benefits, and cost estimates were developed and evaluated for each alternative. Two alternatives were selected for further study on the basis of biological value, maintenance cost savings, maintenance requirements, cost, compatibility with flood control and navigation projects, and non-Federal support.

For this study, detailed designs and costs were developed for alternatives 4 and 5. The designs include constructing islands within Prospect Island, stabilizing the existing levees by adding material to

them, stabilizing existing levees and islands by using biotechnical plantings, and breaching the levees. Both alternatives yielded environmental benefits while protecting the existing projects.

The selected plan (alternative 5) includes eight sinuous islands and a peninsula. The existing interior levees would be reinforced with a 10:1 slope with a 10- to 40-foot-wide berm at an elevation of 3-feet msl. The islands and levees would be further reinforced with biotechnical plantings.

The DWR, the non-Federal sponsor, supports the selected plan and would provide the non-Federal assurances (except lands to be provided by Reclamation), relocation, and any hazardous waste disposal requirements needed to implement the project and to allow for full restoration. The DWR would provide the necessary real interests as determined by the Corps. The DWR would not need to acquire Reclamation's property in fee on Prospect Island since the project would be transferred from Reclamation to the Service.

Adverse effects of implementation of the restoration project are not considered to be significant. A FONSI and Negative Declaration is appropriate based on results of coordination during the public review.

## CHAPTER 10 RECOMMENDATION

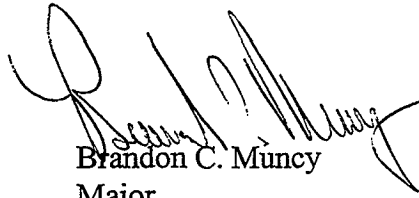
I have weighed the accomplishments to be obtained from the proposed wildlife habitat restoration associated with modifications of the Sacramento River Deep Water Ship Channel against the project costs and have considered the alternatives, effects, and scope of the proposed project modifications.

I recommend construction of the Selected Plan (Alternative 5). This plan, as detailed in this report, consists of stabilizing existing levees by adding material to them, constructing islands and a peninsula within Prospect Island, reinforcing the levees and islands by biotechnical plantings, and finally breaching the levees, so as to restore the freshwater tidal marsh and riparian ecosystem.

The California Department of Water Resources, the non-Federal sponsor, will share in the cost of the project, operate it, and have other responsibilities as specified in the project cooperation agreement, which has been coordinated with the DWR and which DWR shall sign prior to implementation. In summary, the sponsor shall:

- Provide all lands, easements, rights-of-way, relocations, and disposal areas necessary to implement and maintain the project;
- Contribute a maximum of 25 percent of the project modification cost, with credit given for lands, easements, rights-of-way, relocations, and disposal areas;
- Comply with the provisions of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 USC 9601-9675);
- Hold and save the Department of the Army free from damages arising from implementation, operation, maintenance, repair, replacement and rehabilitation of the project modification, except for damages due to the fault of or negligence of the Department of the Army or its contractor; and
- Operate and maintain the project after being notified by Corps that implementation of the project is complete.

I recommend that this Ecosystem Restoration Report for the Prospect Island, California project be approved as the basis for preparation of plans and specifications.



Brandon C. Muncy

Major

Corps of Engineers

Acting District Engineer



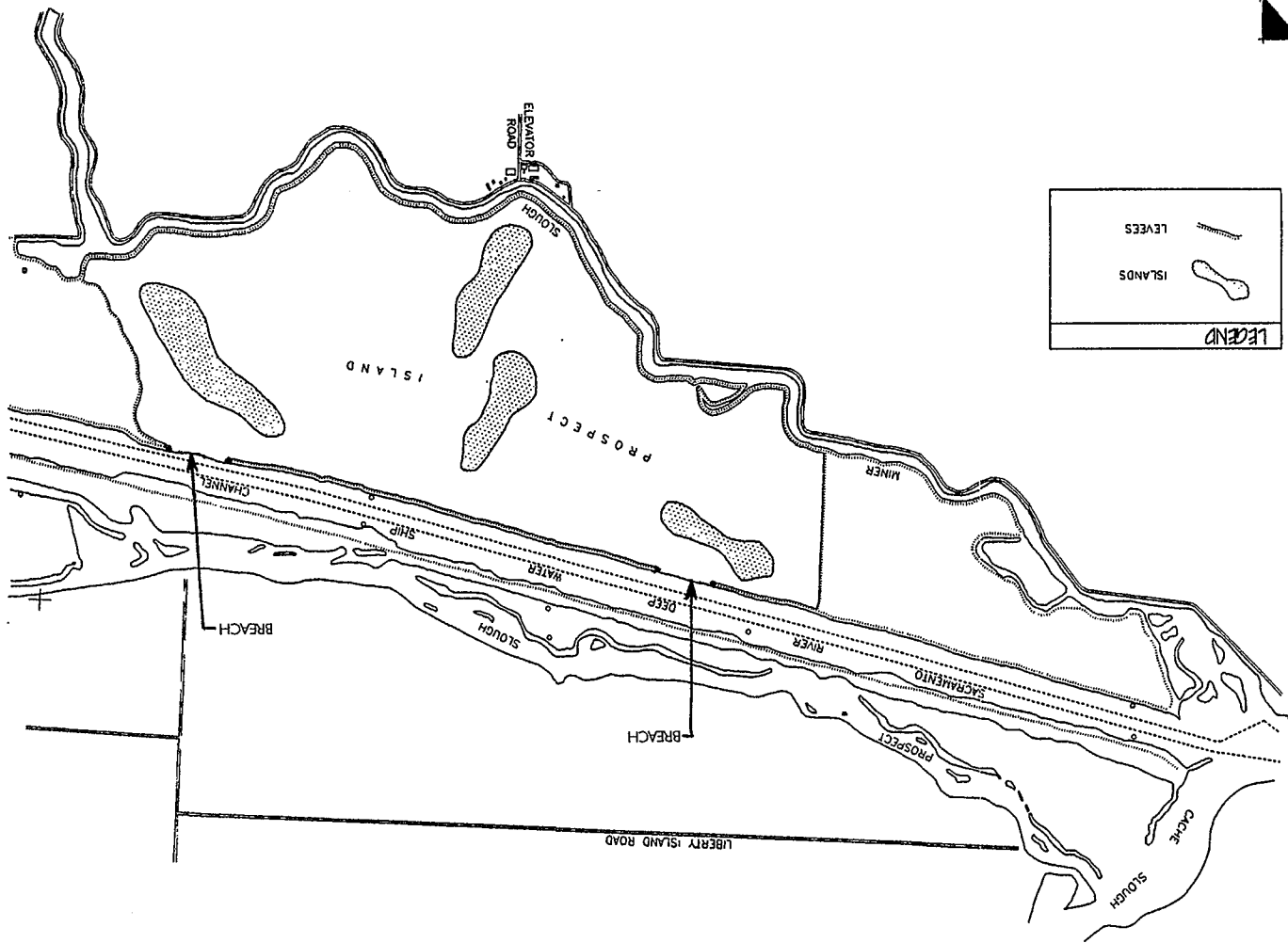
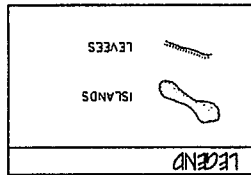
CORPS OF ENGINEERS, SACRAMENTO DISTRICT



Plate 1

# PROSPECT ISLAND FISH & WILDLIFE HABITAT RESTORATION STUDY ALTERNATIVE 1

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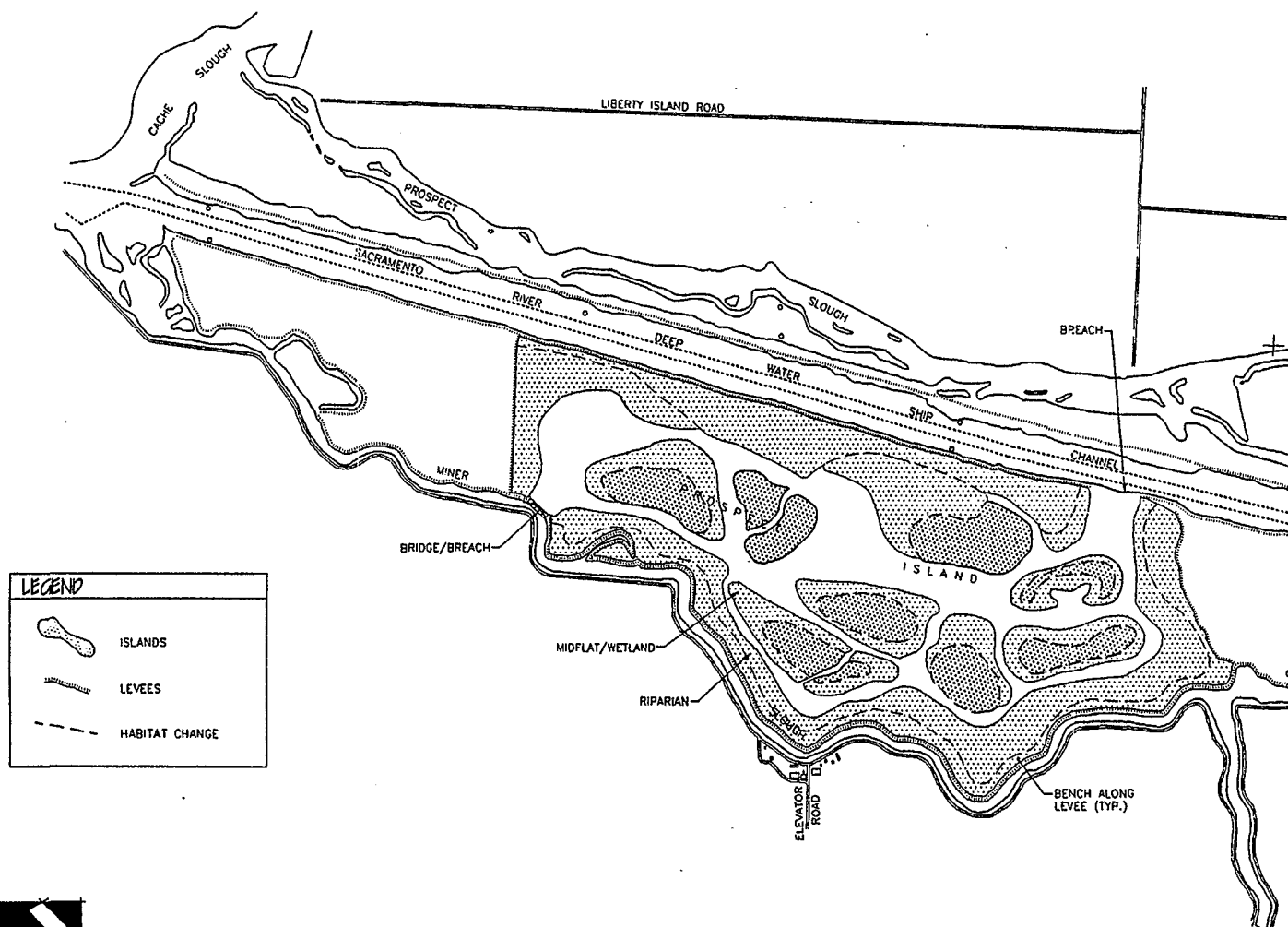


C-088877

PROSPECT ISLAND OF 1-1-77, A-27

C-088877





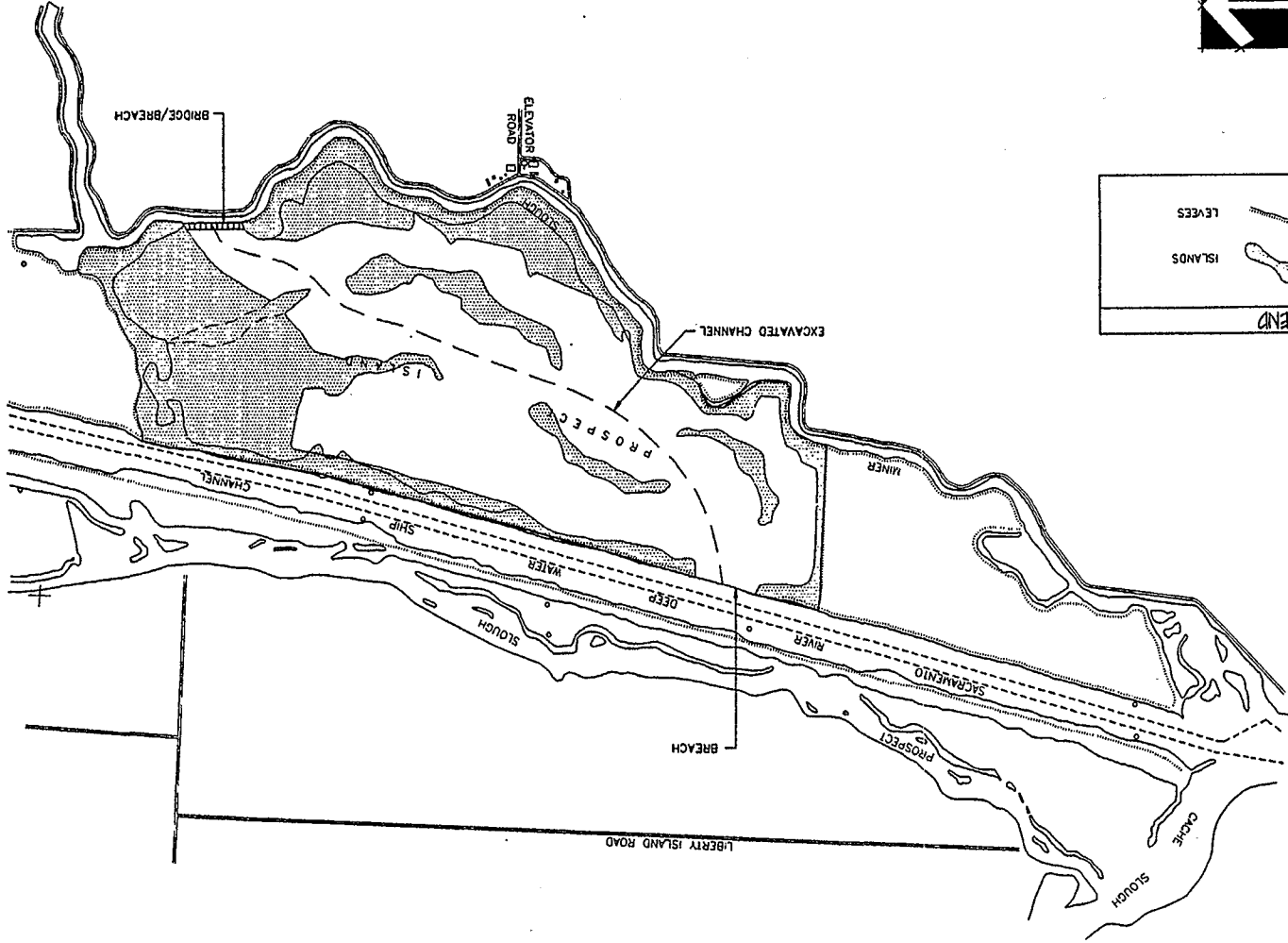
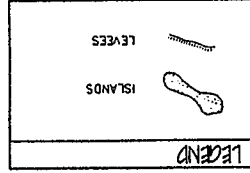
C-08878

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# PROSPECT ISLAND FISH & WILDLIFE HABITAT RESTORATION STUDY ALTERNATIVE 3

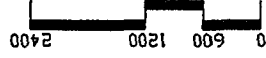
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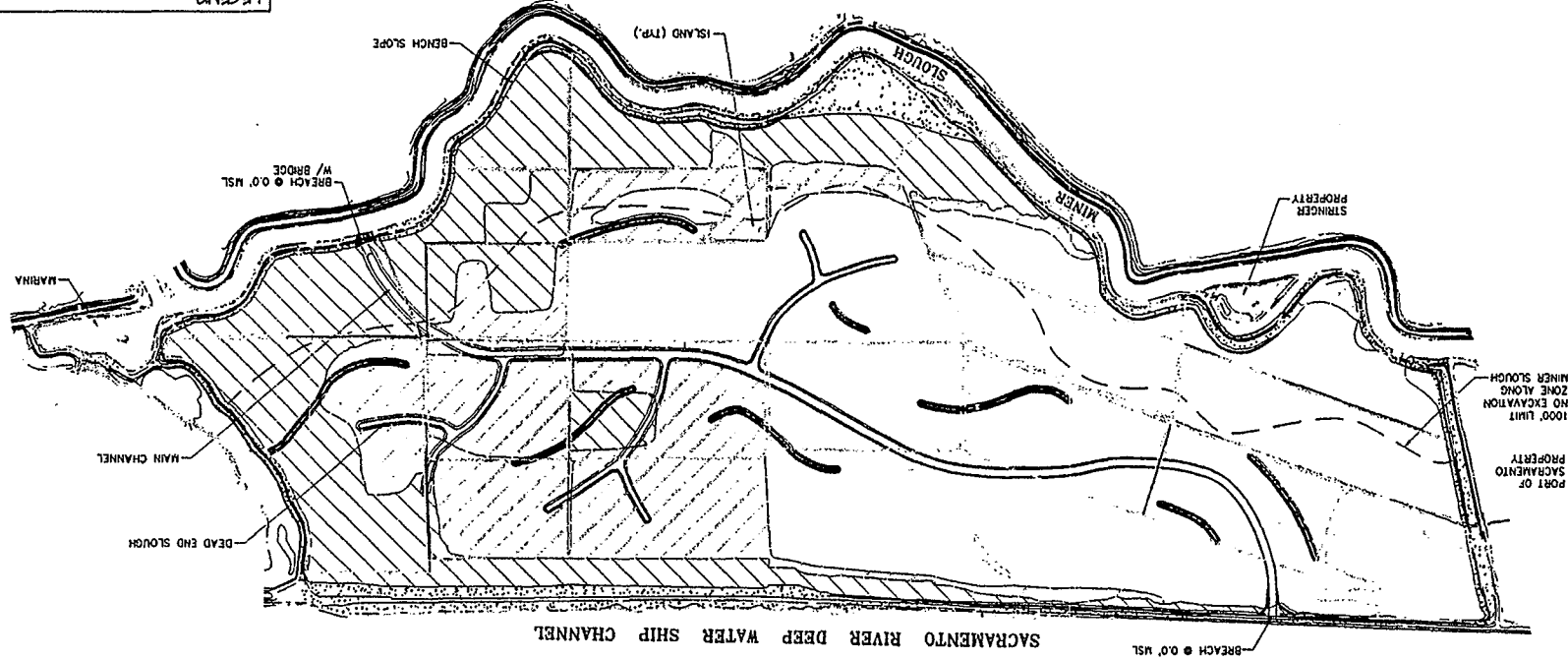
C-088879

# PROSPECT ISLAND

SCALE IN FEET



TOTAL ACREAGE		1316.0
564.875/ARW/ARPLAND (0.00 MS)		153.7
545.75 MS/1/0.0 MS/1 POTENTIAL RILE/EMERGENT		230.0
10.0 MS/1/0.0 MS/1 POTENTIAL RILE/EMERGENT		333.8
0.00 MS/1 MUDFLAT	(NOT SHOWN)	4.0
1.0-1.0 MS/1 OPEN WATER		594.5
HUMAN PRESS	SHRUB	ACRES



C-0880

C-08880



SCALE IN FEET

0 600 1200 2400



Legend	Heavy Metals	Sample	Notes
Red	Lead (Pb)		0.0000
Green	Cadmium (Cd)		0.0000
Blue	Copper (Cu)		0.0000
Yellow	Chromium (Cr)		0.0000
Purple	Mercury (Hg)		0.0000
Orange	Vanadium (V)		0.0000
Grey	Iron (Fe)		0.0000
White	Not shown		0.0000
Black	Not shown		0.0000

KEY: ISLAND CONFIGURATIONS	
10' MOE BENCH W/ 10:1 SLOPE TRANSITION	18.23
40' MOE BENCH W/ 2:1 SLOPE TRANSITION	11.18
COSTING CHAINS TO REMAIN	20.25
SECTION	5000041.7

KEY: INTERIOR LEVEE INFILLAGE	
CONCRETE	18.23
10' MOE BENCH W/ 10:1 SLOPE TRANSITION	18.23
40' MOE BENCH W/ 2:1 SLOPE TRANSITION	11.18
COSTING CHAINS TO REMAIN	20.25
SECTION	5000041.7

